E. J. BUTLER.

EMPIRE COTTON GROWING CORPORATION.

REPORT OF THE ADMINISTRATIVE COUNCIL OF THE CORPORATION SUBMITTED AT THE TWELFTH ANNUAL GENERAL MEETING ON MAY 26th, 1933.

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EMPIRE COTTON GROWING CORPORATION.

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1931-1932.

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The work of the Corporation has definitely not decreased in difficulty during the past year. The problems to which attention was directed in the last Report remain unsolved. Reduction in purchasing ability, inequality in competing power on account of the unstabilised nature of world currencies, political and financial confusion in every quarter, conspire to render a reasonable forecast in any direction impossible.

This year, the Japanese-Chinese differences, the banking crisis in the United States, and the departure of that country from the Gold Standard have, perhaps, been the outstanding events. The European international position would appear to be no less difficult than it was a year ago, nor is there any clearing up of the economic position in Russia.

Whatever else may be true, it remains certain, as was stated in last year's Report, that Lancashire cannot afford to

remain dependent for her raw material on countries whose economic position differs fundamentally from our own. The unanimous decision of the industry to continue the work of the Corporation is convincing proof of what their opinion is on the matter. It is stated below that last year the crop from the more recently developed Empire fields was the largest on record, and in spite of widespread confusion and distress that solid fact remains.

In the following Report an attempt is made to summarize the principal activities of the Corporation during the past year. In addition, there are included from the majority of the cotton-growing countries of the Empire notes supplied by the respective Directors of Agriculture, describing the progress made in the past year and the condition of the current season's cotton crop at the time when the Report was prepared. The Corporation take this opportunity of extending their thanks to the several Directors who have thus enabled them to keep their members in touch with the present position.

The Corporation have consistently held the view that cotton-growing can only be permanently extended provided that the crop is treated as a constituent part of a properly balanced agricultural rotation. In order to make this policy effective, close touch has always been maintained with the various Government Agricultural Departments, on which rests the responsibility for the agricultural policy pursued in each country. It may, for example, be mentioned that in most cases in which Experiment Stations are manned by staff provided and paid by the Corporation, the cost of maintenance of the Stations is usually provided wholly or in part by the local Governments, and it is gratifying to be able to record the whole-hearted manner in which the Government Agricultural Departments are co-operating with the Corporation in their work.

While it may confidently be said that a marked degree of success has now been achieved in the breeding of high-yielding strains of cotton suited to the various conditions of considerable areas in different parts of Africa, limits to increased production are imposed at present by insect pests and by low prices. To the control of the former the Corporation are giving full attention, and much patient work is being carried out, which it is hoped may ultimately give the desired results. But to effect any improvement in the price of the commodity naturally lies outside the Corporation's scope and beyond their power. Nevertheless, although the Corporation are obliged to recognize that any considerable increase in the output of cotton from the Empire can hardly be expected until a rise in prices occurs, they are fully satisfied that their policy of energetically pushing on their work, especially that on plant breeding and on pest control, is that which is best calculated to enable cotton growers—whether European or native—to reap the greatest possible advantage when economic conditions once more make a general increase in acreage a practical proposition.

In face of the prevailing economic conditions, it may seem remarkable at first sight that the crops of 1931-32 from the Empire's new fields (*i.e.*, excluding India) should be the largest on record. The explanation is, however, to be found in the preponderating effect on the total output of the crops of two countries, Uganda and the Anglo-Egyptian Sudan, which last year between them accounted for over 90 per cent. of the whole. In both these countries the crops of 1931-32 were very good, that of the Sudan being easily a record for the country. In Uganda the natives were urged to increase the area under cotton, so that by producing larger crops they might be able to compensate themselves to some extent for smaller prices. This policy has been pursued in the current season also, and is expected to result in a record crop.

On the other hand, in the Sudan the crop of 1932-33 will undoubtedly be a small one, the plants having suffered from disease, and, to a somewhat greater degree than usual, from pests also.

Another interesting feature to be recorded is that the world's consumption of cotton from the new fields in 1931-32 was the heaviest on record, viz., about 422,000 bales, as against the previous highest figure of 345,000 in 1929-30.

Personnel.

It is with deep regret that the Corporation have to record the death of the Rt. Hon. Lord Lovat, K.T., one of their first Vice-Presidents, an office which he continued to hold until he was appointed Parliamentary Under-Secretary of State, Dominions Office, in 1927. After his official connection with the Corporation ceased, Lord Lovat's activities in connection with the Sudan Plantations Syndicate continued to bring him into close touch with the Corporation's work, and he will be much missed at the meetings of the London Advisory Committee for the co-ordination of Agricultural Research in the Sudan, of which the Director of the Corporation is Chairman. At the autumn meeting of this Committee representatives of the Sudan Government and of the Syndicate are invited to be present, and Lord Lovat, nominated by the latter body, rarely missed a meeting, frequently travelling from Scotland for the express purpose of being present.

The Council also have to deplore the loss of the following members or former members since the last Annual Meeting of the Corporation:—Mr. W. Howarth, Mr. T. Garnett, Mr. H. Roberts, and Mr. J. Crinion. Mr. Crinion was a

member of Council from 1922 until his resignation last year owing to ill-health; Mr. Howarth and Mr. Roberts were members of both the Council and the Executive Committee. Mr. Howarth was, in addition, a member of the Board of Trustees, a body which has suffered a further loss by the death, in October last, of Sir William Mercer.

The Corporation tender their congratulations to Colonel J. J. Shute, a member of Council and of the Executive Committee, on his election as Member of Parliament for the Exchange Division of Liverpool. Their congratulations are also due to Mr. L. Browett and Mr. M. D. Peterson, members of the Executive Committee, on the honours of C.B. and C.M.G. respectively recently conferred on them.

It was reported last year that Mr. Ashley had resigned from the Council, on which he served as the representative of the Board of Trade, on ceasing to be an officer of the Board. It is with great pleasure that the Corporation are able to report that he has now accepted appointment as a co-opted member. Mr. A. C. C. Robertson has also been co-opted as a member of Council in place of the late Mr. Crinion.

The Secretary of State for the Colonies has appointed Sir William Gowers, K.C.M.G., Senior Crown Agent for the Colonies, as the second representative of the Colonial Office on the Board of Trustees, in place of the late Sir William Mercer.

Reference is made under the section of this Report that deals with India to the appointment of Sir Richard Jackson, Chairman of the Executive Committee of the Corporation, as Chairman of a Government Committee to consider the possibility of increasing the consumption of Indian cotton in this country.

Levy.

The Cotton Industry Act, 1928, under which the Corporation receives the proceeds of the Spinners' Levy, expires in July next. It will be remembered that this Act provides for the rate of the Levy to be 3d. per 500 lbs. of cotton purchased, or such less rate as the Corporation, with the approval of the Board of Trade, may fix in respect of any year.

The Levy remained at the rate of 3d. for two years only, and since that time the Board of Trade have annually approved the Corporation's suggestion that it should be reduced to 1d. per 500 lbs. When considering the position that will arise when the present Act expires, the Corporation, fully realising the difficulties which confront the cotton industry at the present time, decided that the spinners should only be asked to approve the promotion of a new Bill in which the former maximum rate of the Levy, namely, 3d. per 500 lbs., of cotton, would be reduced to 1d., the rate now actually in force. The Federation of Master Cotton Spinners' Associations, The Cotton Spinners' and Manufacturers' Association, and important outside bodies were consulted, and all recorded their approval of this proposal, while the Board of Trade also readily gave their assent. Assured, therefore, of the full support of the spinning industry, a Bill on these lines was introduced in the House of Commons on February 14th, again by Sir Gerald Hurst, M.P., who had sponsored the two previous Bills, and received its Second Reading. Its subsequent progress gives reason to hope that it may have passed through all its stages shortly before this Report appears.

India.

Under the Agreement concluded at Ottawa with the Government of India, an undertaking was given that the Government of the United Kingdom would co-operate in any

practicable scheme that might be agreed between the manufacturing, trading and producing interests in this country and in India for promoting, whether by research, propaganda or improved marketing, the greater use of Indian cotton in the United Kingdom.

As a result of this undertaking, representatives have been nominated by trade organisations in Lancashire, and have been invited by the Government to form a Committee to promote the greater use of Indian cotton in this country. Of this Committee, Sir Richard Jackson, Chairman of the Executive Committee of the Corporation, is Chairman, and of the members already nominated, Mr. Butterworth, Mr. Houghton and Mr. Littlewood are members of the Corporation's Administrative Council.

As the work of the Committee develops the Government will, in consultation with the different interests concerned, invite other sections of the industry to nominate representatives on the Committee. The secretarial and administrative work of the Committee will be undertaken by the British Cotton Growing Association.

The Indian Central Cotton Committee, relying on the funds and expert advice at its disposal, continues to co-operate with Agricultural Departments of the Provincial Governments in their task of improving the quality of Indian cotton. It maintains its own Technological Laboratory and also co-operates with the Institute of Plant Industry, Indore. In 1931 the Committee published a report entitled " Cotton Improvement in India," which showed that on an average of the seasons 1915-18 medium and long staple cotton ($\frac{7}{8}$ in. staple and over) accounted for 1,148,000 bales, whereas on an average of the seasons 1925-30 the amount of such staple had risen to 1,458,000 bales. The chief classes of Indian cotton produced during each of the past three seasons are shown in the following table, together with the blowroom loss and

THE CHIEF CLASSES OF INDIAN COTTON.

Hedge Contract.	Description of Cotton.	Blow-Room Loss %	Counts.	Production in 000 Bales of 400 lbs.			Normal Indian Mill Demand in 000 Bales.	Percentage of Normal Exports to		
				1930–31.	1931–32.	1932–33.		Far East.	Continent	United Kingdom.
BENGALS	United Provinces... Rajputana ... Sind-Punjab ... Others	9–11	8/10's reeling or weft yarn	—	—	—	—	—	—	—
Total	BENGALS	—	—	999	753	752	258	38·9	54·0	7·1
BROACH	Broach-Ankleshwar ...	10	18/20's weft	—	—	—	—	—	—	—
	Surat	8	20/22's warp... ...	—	—	—	—	—	—	—
	Saw-ginned Dharwar ...	10	20's warp	—	—	—	—	—	—	—
	Navsari	7	30's warp, 40's weft...	—	—	—	—	—	—	—
	Punjab-American Sind-American ...	9–10	20/24's warp... ...	—	—	—	—	—	—	—
	Dholleras	14–16	20/22's warp... ...	—	—	—	—	—	—	—
Total	BROACH...	—	—	1,007	1,105	1,162	622	60·5	20·8	18·7
OOMRAS	Khandesh...	11–12	10/12's reeling ...	—	—	—	—	—	—	—
	Central India	14–15	16/20's weft	—	—	—	—	—	—	—
	Barsi and Nagar	14	16/20's weft	—	—	—	—	—	—	—
	Hyderabad-Gaorani ...	14	26/28's warp, 30/36's weft	—	—	—	—	—	—	—
	Berar	11	12/14's reeling ...	—	—	—	—	—	—	—
	Central Provinces No. 1...	7	12/16's reeling ...	—	—	—	—	—	—	—
	Central Provinces No. 2...	9	10/12's reeling ...	—	—	—	—	—	—	—
Total	OOMRAS...	—	—	2,274	1,355	1,660	715	65·9	30·8	3·3
SOUTHERNS ...	Kumpta-Dharwars ...	13–15	22/28's warp... ...	—	—	—	—	—	—	—
	Westerns and Northerns	14–15	20's warp	—	—	—	—	—	—	—
	Cocanadas...	14–15	20's warp	—	—	—	—	—	—	—
	Tinnevellies	9	20's warp	—	—	—	—	—	—	—
	Salems	—	—	—	—	—	—	—	—	—
	Cambodias	9	28/30's warp, 36/40's weft	—	—	—	—	—	—	—
Total	SOUTHERNS	—	—	707	808	748	629	54·2	36·3	9·5
ALL OTHERS ...	Comillas, Burmas, etc. ...	9	8/10's reeling ...	123	67	103	10	41·7	50·0	8·3
Grand Total	—	—	—	5,110	4,088	4,425	2,234	* 57·1	* 35·3	* 7·6
EXPORTS (Average of last 3 years in 000 bales of 400 lbs.)	—	—	—	—	—	—	—	† 1,781	† 987	† 228

* Trade Estimates. † Official Estimates.

spinning capacity of each, total exports and total consumption by Indian mills, with percentages of the extent to which each particular class is exported to the particular overseas groups of markets, namely, Japan and the Far East, Europe, excluding the United Kingdom, and the United Kingdom.

Cotton is receiving its full measure of attention in connection with the Sukkur Barrage developments. The Barrage was officially opened by His Excellency the Viceroy more than a year ago, and in January His Excellency the Governor of Bombay visited the Barrage to inspect progress during the year. The whole irrigation system feeds some 7½ million acres, of which about five-sixths are already allocated to private individuals. Of the remaining one-sixth, a certain amount has been reserved for military pensioners. Of the 1,345,000 acres irrigated during the autumn season of 1932, 353,000 were given up to cotton, which is doing particularly well. During the spring season 650,000 acres were irrigated, most of which is under wheat. It is estimated that as a result of the Sukkur Barrage scheme the total area under cotton in Sind will increase from 300,000 to 800,000 acres.

On the research side, the Indian Central Cotton Committee has sanctioned a grant of Rs. 31,000 per annum for a period of three years to be devoted to the extension of improved varieties of cotton in the Barrage areas, in accordance with a scheme prepared by the Chief Agricultural Officer in Sind. In this connection, it may be remembered, the official report of the progress made in the Sukkur Barrage research on cotton stated that among the types of cotton under test at Sakrand were types suitable for all purposes. The valuation reports and the spinning tests of those cottons indicated that many of them were capable of commanding a substantial premium over Broach and of spinning counts from

34's to 80's. The longest stapled cotton produced at Sakrand is a strain of Sea Island cotton which has a staple of $1\frac{1}{2}$ ins. and which is capable of yielding under Barrage conditions 600-800 lbs. of seed cotton per acre. There are other "general purpose" cottons, with a staple of from $\frac{7}{8}$ in. to $1\frac{3}{16}$ in., which yield 1,200-1,600 lbs. of seed cotton per acre and which are of the type which the Indian Central Cotton Committee consider most desirable for trade requirements. The Chief Agricultural Officer arranged a series of field trials of these cottons under district conditions to supplement the research work at the Agricultural Research Station, Sakrand, and to obtain definite and reliable data upon which to base a detailed programme of multiplication and extension in the future.

The post of Geneticist and Botanist at the Institute of Plant Industry, Indore, has been filled by the appointment of Mr. J. B. Hutchinson, until recently a member of the staff of the Corporation's Research Station, Trinidad. The work of the post to which Mr. Hutchinson has been appointed will consist largely of the application of plant breeding in the improvement of Indian cottons, and will thus be of direct value to the objects of the Corporation.

The cotton forecast for the year 1932-33, published towards the end of April, shows an acreage for all India of 22,558,000 acres and an estimated yield of 4,516,000 bales. This is a decrease of 4 per cent. in the area, but an increase of 11 per cent. in the yield as compared with the final figures for the year 1931-32.

Australia.

In Queensland, the season 1931-32, which had been none too good at the time when this Report was written last year, was bad throughout, and the crop of less than 5,000 bales was

the smallest for many years. Enough seed was applied for to plant 65,000 acres, which was a record acreage. Late planting rains were followed by very heavy falls in December, but after that time intensely dry conditions and high temperatures prevailed for the rest of the season. The cotton crop was a failure, but at least it stood up to the drought better than every other crop, and if only there had been even moderate rainfall in February, good yields would have been obtained. One or two small districts did, in fact, have local storms in that month and yields of 800 lbs. of seed cotton per acre were obtained.

Development of the organization for the supply of pure seed was inevitably retarded by the bad season. Sufficient seed of improved Durango to plant 4,000 acres was issued from the Research Station last season, but the increase obtained will only suffice for a further 1,000 acres this year. A somewhat severe setback has thus been given to the seed supply scheme, as it was hoped that sufficient of this strain would have been available to have planted the whole of the central Queensland area this year. Small quantities of other Upland varieties have been multiplied in different districts, and the testing of the more recently imported medium staple cottons has been continued. Every effort is being made to increase the stocks of seed of the most promising varieties, so that a wide range of tests may be carried out to determine their general suitability.

Contact is being maintained with the Corporation's Research Station, Trinidad, in connection with the problem presented by certain of the Queensland soils which have an excessive nitrogen content. At the request of the Corporation, the Rothamsted Experimental Station also submitted suggestions as to possible methods of treatment.

In the current season (1932-33) sufficient seed was issued to plant at least 80,000 acres. Much of the increase in area will be in newly-burned scrub in the Callide Valley. There was a decided tendency to increase the acreage per grower in some districts, owing to the farmers endeavouring to recoup their losses from previous bad seasons, and to the fact that cotton offered better possibilities of achieving this than any other crop. In some of the older dairying districts, however, some reduction in acreage occurred, the severely dry winter causing farmers to plant all their available land with fodder crops to replenish their supplies.

The conditions were generally favourable to cotton until December, but in January a period of extremely high temperatures occurred, which caused shedding generally and a stoppage of growth. In mid-January a series of good rains improved prospects materially, and although it was reported in March that rain was badly needed, it is believed that if insect attacks are not serious the crop should be at least four times as large as the small output of last season.

South Africa.

At the request of the Executive Committee, the Chairman, Sir Richard Jackson, left England in January to pay a visit of inspection to the Corporation's Stations in the Union of South Africa, Rhodesia and Nyasaland. He is expected to return shortly before the Annual Meeting at which this Report will be presented.

The season 1931-32 was one of the most unfavourable of recent years for cotton in the rainfall districts of South Africa. Low prices at planting time and the prospect of losses due to the exchange when exporting to countries no longer on the gold standard gave little hope of a profitable crop, and the

cotton acreage was very considerably reduced in consequence. Periods of drought in the growing season seriously affected the crop in several districts and caused the average yield to be low over the small area that was planted. The total crop was thus only 2,801 bales of 400 lbs., as compared with 8,123 in the previous season.

Even in the Orange River irrigation areas, where the greater part of the cotton crop is produced, other crops were substituted for cotton, owing to the low prices obtainable. Moreover, it is doubtful if this area will again grow cotton to any extent unless the price rises to about 6d. per lb. The district in which most of the cotton has hitherto been grown is a considerable distance from the railway, with the result that transport charges are heavy, a fact that materially increases the price below which farmers find that cotton-growing does not pay them. The crop last season in that area amounted to only one-sixth of that of 1930-31. It is particularly regrettable that low prices led to so big a reduction in the acreage, because the season in that district was climatically one of the best recorded. At the Experiment Station an area of $5\frac{1}{2}$ acres produced over 3,100 lbs. of seed cotton per acre. The variety trial showed that almost any variety of Upland American would give a high yield in the Orange River area, and selection of the best type will therefore depend largely on lint characters.

In the rainfall areas, on the contrary, the conditions were unfavourable, as already mentioned. At the Cotton Breeding Station at Barberton a good deal of the young crop was destroyed by a dust storm early in December, and two dry spells which occurred later effectively prevented anything like good yields. The variety trials at the Station were ruined, or so badly damaged, by the dust storm that little progress could be made in testing the several strains. From a similar

trial on a farm a few miles away, however, satisfactory yields were obtained, and the strains under test are clearly well suited to the district.

Work on the possibility of controlling bollworm by means of parasites bred artificially and released in the field was continued. From last season's results it appears that different strains of the parasite that is being bred exist in the neighbourhood, and these react differently to temperature. It seems probable, therefore, that different strains must be bred for release experiments in summer and winter respectively.

The appointment of an additional entomologist to the staff at Barberton, which was reported last year, has enabled intensive work to be started on stainers, which are the cause of very heavy loss in the cotton crop in many countries in Africa. In those parts in which the variety U.4, which is resistant to jassid, is found suitable, the bollworms and stainers constitute the principal limiting factors to cotton-growing.

Mr. Milligan considers that plant-breeding work alone is unlikely to achieve against these other pests the success that it has had in the fight against jassid. The other crops and host plants, on which many of these pests subsist both during the growing and the off season for cotton, will continue to be grown as part of the farmers' crops, and the essence of the problem, therefore, is to discover how, when these existing conditions are accepted, cotton can best be grown profitably.

On these grounds Mr. Milligan has suggested that the Corporation's work in South Africa should now be given a definite bias towards insect control. The Executive Committee have considered a note by Mr. Milligan on this

subject, and have asked him to submit concrete proposals with an estimate of their cost. Possible developments in this direction were to be discussed on the spot with the Chairman in the course of his visit to the Corporation's Stations.

At the Experiment Station at Magut, Natal, variety tests were laid down with the newer strains from U.4. Great difficulty was experienced in keeping the plants alive through the drought, and resort was had occasionally to hand watering. In April, unfortunately, a heavy bollworm infestation so reduced the crop that the resultant yields gave no indication of the real merits of the several strains.

Sir Alan Pim, whom Mr. Milligan accompanied in 1931 on his mission to Swaziland, in the capacity of Agricultural and Economic Adviser, was appointed by the Dominions Office last year to undertake a similar mission to Bechuanaland, and the Corporation were again asked to allow Mr. Milligan to assist him. The Corporation readily acceded to this request, and Mr. Milligan devoted the greater part of November and December to this work.

At a meeting in the Autumn with the Chairman and one of the directors of the Premier Cotton Estates of South Africa Ltd., who were then in England, a wish was expressed that a representative of the Corporation should visit South Africa to confer with the Board on the action that should be taken consequent upon a decision reached by the Executive Committee that the Corporation could no longer finance the Estates. Sir Richard Jackson consented to undertake this work while making his present tour in South Africa. Low prices and a succession of unsatisfactory yields have resulted in the Estates operating at a loss, which up to this year has been made good by the Corporation. Pending other

arrangements arising out of the consultations between Sir Richard Jackson and the Board of Directors, the Estates have been put on a maintenance basis and all expenditure reduced to a minimum.

As regards the present season in the low veld, Mr. Parnell reported as follows in the first week of March :—

The acreage under cotton in this area is again low, for the same reasons as applied last season. South Africa departed from the gold standard just too late to admit of increased areas being planted on that account.

The season started favourably and planting generally was done early and in good conditions, rains were better distributed than usual and early growth was good. Some damage was done in places by dust storms and hail, but the bulk of the crop was in good condition till about the end of January. No good general rain was received, however, from 20th January to the end of February. Cotton stood up to this drought very well indeed, as compared with other crops, but finally began to go off badly in places. The chief damage was done to early well-developed crops ; rather later plantings, particularly in several places where the spacing was 3 ft. by 3 ft., came through very well indeed and should give a good crop.

On the Station an excellent start was made, but a succession of dust storms, with a little hail, so damaged the young crop that our stands are very poor and the crop generally is backward. This undoubtedly helped the plants to stand the drought, however, and they are now looking very well and flowering profusely. About 1½ in. of rain fell in the first week of March and the crop should now go ahead very well.

The season's work will not be a good one, as the stands are too poor to give reliable and accurate figures. One point about adverse conditions, however, is that they show up good, sound, tough strains against weaker ones which are unable to stand up against the vicious climate of these parts.

Rotation crops started very well, being planted after the storms. They have suffered badly during the drought, particularly maize, but quite useful results should be obtained from most of the experiments.

In the Magut district in Natal the season 1932-33 commenced with very good rains in October, permitting of planting about a month earlier than usual; early planting generally seems advisable. Until the middle of January conditions remained fair, encouraging a useful growth, but for a month from that time a period of hot dry weather was experienced which previous conditions had not predisposed the cotton plants to withstand, with a consequent reduction in potential crop.

While the acreage under cotton in the district bears no comparison with that of some previous seasons, there is a good scattering of small fields all over the district which, generally speaking, have responded well to the conditions experienced.

The chief work on the Station is the variety test of the later strains evolved from U.4 at Barberton. This has every appearance of finishing in a satisfactory manner. Fair yields are expected from multiplication areas of these strains. Rotation crops, planted later than cotton, suffered the full effects of the drought, but some useful information was obtained by virtue of this. It is thought that good progress has been made in the production of a more drought-resistant type of maize. If this work is finally successful it will be of great importance to the agriculture of the district.

The Principal Field Husbandry Officer of the Department of Agriculture, writing in February, said that they were then suffering from the worst drought for 30 years, and that practically no cotton had been planted in the middle-veld areas. He feared that the report of the present season would be far from cheerful.

In the Orange River irrigation area, where the greater part of the crop from the Union is usually produced, it is estimated that the yield will be about the same as that of last season, *i.e.*, 1,250 bales of 400 lbs. The conditions in the district have been very favourable, and the amount anticipated this season is only a very small percentage of the cotton that could be grown in the area if prices improved sufficiently.

Swaziland.

The report of Sir Alan Pim on his mission to Swaziland, on which he was accompanied by Mr. Milligan as Agricultural and Economic Adviser, contains many references to cotton-growing prospects in the country.

The crop is described as being probably the safest of all dry land crops on light and relatively poor soils such as are found in the middle veld, where, moreover, rainfall is uncertain, both in its amount and distribution. It has, however, been a disappointment as an irrigated crop in Southern Swaziland. Good crops have been produced, but they have usually been ruined by stainer.

Hitherto cotton-growing in Swaziland has been practically confined to Europeans. During the past year, however, considerable interest in the crop has been shown by the Paramount Chief and his Council. The Corporation promised to assist by giving advice on methods of cultivation

and supervising the growing of the crop, and, as a result, plots of cotton and food crops have been planted in certain areas under supervision. In addition, small plots of cotton have been planted at schools and mission stations, while a few natives are trying the crop in their own land. The Swazi native is primarily a cattle owner; with few exceptions, his agriculture is completely undeveloped and progress in this direction is likely to be slow. However, it is considered that cotton, with its value as a cash crop and its additional value as a rotation crop, will become increasingly popular in areas where it can be cultivated satisfactorily.

As regards the season 1931-32, except in the neighbourhood of the Bremersdorp Station, the conditions were again unfavourable and ploughing was consequently delayed. During the growing season the rainfall was light and the yields of cotton considerably below the average of previous years.

In Southern Swaziland conditions were even worse than elsewhere. No effective rains fell until mid-December, and these were followed first by a period of drought and then by a series of dust storms which practically wiped out the cotton.

At the Bremersdorp Station, on the other hand, the conditions were distinctly favourable for cotton, though too dry on the whole for most of the rotation crops. The average yield of cotton on the Station was 1,400 lbs. of seed cotton per acre.

The experiments that were duplicated under irrigation conditions at Ingwavuma were a failure, owing firstly to the drying up of the river and subsequently to damage by bollworm and stainer.

This season the acreage under cotton has been very considerably reduced, owing to the low prices prevailing and the uncertainty as to the currency position. With the loss on exchange last season, it was almost impossible, even under the most favourable conditions, to grow the crop at a profit. The proposed acreage was further reduced by the lack of suitable early rains for ploughing and planting in some districts.

In general, however, the season has been much better than the two preceding ones, as sufficient rains fell during November to permit of planting and to give a good start to ratoon cotton. Ample rains fell during December and early January to give the crop a good start and to create a reserve of moisture in the soil. A very hot, dry period, which followed in late January and early February and was becoming serious on ratoons, was ended by a good fall in mid-February.

With regard to insect pests, both Sudan and American bollworms have been present during the season, and the infestation has increased since the beginning of February. Stainer has been noted at an earlier date than usual in fields of ratoons and very early plant cotton, and the crop prospects will be influenced by the degree of multiplication and spread of the pest.

At the Bremersdorp Experiment Station conditions were very favourable at the commencement of the season, and the crop was planted under excellent conditions. Unfortunately, the Station was in the centre of an area which suffered severely from a hail storm in early December, and this, with a series of dust storms following, wiped out most of the cotton on the Station. It was by that time too late to replant cotton and a new programme of work had to be devised with a view to gaining information on various rotation crops.

On the other hand, the Station at Ingwavuma and the cotton grown under irrigation at Nsoko had had better weather up to the time when this Report was written than they had experienced for several seasons. The main cause for uncertainty was the risk of damage by stainers.

The work that is being done on rotation crops is very valuable, because road transport charges are so heavy that it is impossible to export maize, for example, unless very high yields can be obtained. In fact, in face of the falling prices of all crops, cotton is likely to be the main cash crop of the country.

In conjunction with the staff at Barberton, work has been started this season at various centres in Swaziland on records of stainer and American bollworm incidence.

Southern Rhodesia.

Notwithstanding the favourable prospects for the 1931-32 crop which Major Cameron was able to report in February of last year, the final results were poor. Late and continued rains favoured an increase in insect pests, especially stainers, and it was doubtless the stainer attack that caused internal boll disease to be worse and more widespread than in any previous year. The crop opened badly, making picking operations difficult, and this, combined with the low prices, led to the abandonment of a considerable acreage as not worth picking. The total crop amounted to no more than 580 bales.

One of the more serious results of the conditions last season is that the boll disease affected the germinating power of the seed for this year. A heavy seed rate was recommended in consequence, in the hope that fair stands would thus be obtained.

Unlike the greater part of the country, the Cotton Breeding Station at Gatooma experienced the best season since it was established seven years ago. Jassid attack was certainly the heaviest recorded, but this rather helped the work than otherwise, as it made it possible to discard or retain with greater confidence selections for jassid-resistance. This is the first requisite for any strain for Southern Rhodesia, and the season has shown that the power of resistance to jassid of most of the strains grown at the Station can be improved by further selection. Two of the most promising of the U.4 derivatives have been issued to selected farmers for large-scale observation this season.

The fact that the conditions at the Station differed so markedly from those in some of the other cotton-growing districts emphasised the necessity for testing, in different parts of the country, the strains bred at the Station. This has always been recognised, but limitations of the Station's budget have made it impossible to provide either the staff necessary or the travelling facilities to enable full records and observations to be made of the behaviour of different strains under diverse conditions of insect pests, soil and climate. The Corporation have accordingly allocated funds this season to enable this extension work to be carried out more satisfactorily in the hope that observations on the condition of the crop in the different districts at different periods of the season may supply useful information as to the reaction under various conditions of the strains put out by the Station.

During last season two members of the Corporation's staff at Barberton and two from Nyasaland spent a few days in Southern Rhodesia at the same time. This afforded an admirable opportunity for the discussion of common problems, of which full advantage was taken, and visits were

also paid to some of the cotton-growing districts in the company of Major Cameron.

Writing of the outlook for the future, Major Cameron says that the low prices prevailing have caused a further reduction in acreage this season. He continues : " It must be remembered, however, that those associated with the furtherance of the industry have studiously avoided any measures which might savour of propaganda, preferring to let the crop establish itself on its own merits. Neither has it been considered necessary to advocate artificial measures to enhance prices. A limited number of growers are beginning to realise that even at to-day's low prices, cotton can still be made a payable crop. In certain outlying districts, where hitherto maize has been the staple crop, it is not now possible to grow it at a profit, and some alternative will have to be found. So far, there is only one alternative on the horizon and that is cotton. The time seems ripe for considering the feasibility or otherwise of encouraging natives to grow cotton. The outlook in this direction should be promising, as several of the Native Reserves are situated in areas which are undoubtedly suited for cotton-growing. In the event of it being decided to follow up this line of cotton development, it will be necessary to do so with caution, and careful organisation will be required in order to ensure satisfactory marketing facilities."

The selections from U.4 which have been bred at Gatooma appear to be well suited to the country, so far as they have yet been tested. A number of growers are already finding that a small profit can be made from cotton where good yields are obtained, and it is reasonable to expect that the crop will make headway in the country if a small advance in prices occurs.

Writing at the beginning of March, Major Cameron reported that the season 1932-33 had been favourable up till then. Germination had not been very good, but not so bad as had been feared, considering that last season's seed was mostly of a low germinating capacity. It was impossible at that time to make any forecast as to the crop for the season.

Northern Rhodesia.

In view of the low prices obtainable for cotton, it is hardly surprising that farmers show little enthusiasm for the crop at the present time. The yields so far obtained in Northern Rhodesia have been low and, as mentioned last year, it has not been considered advisable to issue seed for general use. The greater part of the cotton sold last season came from the Experiment Station at Mazabuka, and it is satisfactory to be able to record that it was reported to be the best in grade for the past few years. The staple was $1\frac{1}{8}$ in. and the grade was "Strict Good Middling."

The experimental work has been mainly directed towards the study of American bollworm and stainers, which are the present limiting factors in establishing cotton as a commercial crop.

An investigation into the reaction of various strains of U.4 to differing soil conditions is being undertaken. This matter is of importance as the influence of soil conditions appears to affect the incidence of the strainer through the habit of the plant. In addition, an assessment of the damage caused by bollworm and stainer is being made and the period during which maximum damage occurs determined.

In the present season seed has been issued to seven farmers, who have kindly agreed to co-operate by establishing observation plots. In addition, seed was supplied for some

75 acres to be cultivated for the recognised rotational benefit of the cotton plant on local soils and for winter feed. The season was later in starting than is usual. Ploughing rains did not fall until the first week in December, with the result that planting was nearly three weeks later than in the past three years. The weather since planting has been very uncertain. Periods of heavy rain, associated with low temperatures and waterlogging, have alternated with dry periods. It is only during the latter that the growth has been normal.

Anglo-Egyptian Sudan.

It is gratifying to be able to report that the season 1931-32 in the Sudan fulfilled the promise it showed when the Director of Agriculture wrote the note on the season's prospects in this Report last year. The total output of cotton, Egyptian and American types combined, reached a figure of 234,964 bales of 400 lbs., which easily constitutes a record for the country.

This gratifying result is due to the fact that a satisfactory yield was obtained in the Gezira, where the average yield over an area of 193,979 feddans was 4·15 kantars per feddan, as compared with only 1·35 kantars per feddan in the previous year, *i.e.*, 395 lbs. of lint per acre as against 128 lbs.

On the area allotted to the Kassala Cotton Co., which amounted to 19,191 feddans, the yield was 5·17 kantars per feddan, the best yield yet obtained from so large an area since the Gezira scheme was started.

The crops of the two previous years suffered severely from damage done by Blackarm and Leaf Curl. Before the beginning of the season 1931-32, in the hope of minimising

the severity of the attacks, various measures were adopted :— (*a*) the rotation was changed to cotton followed by two fallows, (*b*) dura was relegated to blocks away from the cotton as a temporary measure, and lubia discontinued almost entirely, (*c*) fresh seed was imported from Egypt, (*d*) this seed was treated with a disinfectant, (*e*) rigorous steps were taken to cut out all " volunteer " cotton plants appearing in land on which cotton was grown in the previous year. It is not possible to say what share each of these measures contributed to the improved yields that followed. So far as Blackarm is concerned, possibly the fact that rains were only slight during the sowing period and that climatic conditions generally were favourable to the plant in its early stages was as important a factor as any.

There is considerable evidence that the " volunteer " plants springing up on the previous year's cotton land are an important source of infection of the growing crop. By changing the rotation so that cotton is followed by a fallow instead of by dura, the previous year's cotton land is not irrigated, and there is no water from that source to cause " volunteer " cotton plants to spring up. The next step is to stop them springing up as a result of rain, and the only means of preventing this is to ensure that all plants are pulled up by the roots instead of being cut down. This year experiments have been tried with several different implements designed for this purpose, and a type selected for use next season.

The relegation last season of dura, the tenants' food crop, to separate blocks necessitated their having sometimes to walk considerable distances to their dura crops, and this practice obviously could not be continued. To overcome this difficulty, a four-year rotation is being introduced to include a

fallow both immediately before and immediately after cotton, and also dura, while lubia, the tenants' fodder crop, will possibly be included to some extent as well, so as to make it possible for them again to keep stock.

The season 1932-33 has again been unfavourable. Rains in June, August and September were again much above the average. The heavy August rainfall delayed planting in parts of the area, and late-sown cotton in the Gezira usually means poor yields and low grades. The climatic conditions were favourable to the development of Blackarm and Leaf Curl, and the importance of " volunteer " plants, brought up by the rain in last year's cotton land, as a source of infection of the latter disease in particular, was emphasised. Heavy shedding also took place, and this was partly due to American bollworm, which was more in evidence than usual. A description by the Director of Agriculture of the conditions prevailing this season and their effect on the crop is given below.

Both in the Gash Delta and at Tokar the yields per feddan were better than in the previous year. The effective area flooded was, however, in both places considerably less, and the total crop produced showed a decrease.

As regards American-type cotton, the amount grown under irrigation showed a very marked decrease, owing to the low prices, and for the same reason cotton as a rain-grown crop has almost disappeared in the Northern areas. In Kordofan and the Nuba Mountains, on the other hand, though the cultivators were warned that the price that could be paid would be less than in the previous year, there was little falling-off in the demand for seed. The crop produced was smaller, however, owing to locusts. These destroyed most of the early food crops, which had, therefore, to be replanted. So much of the cultivators' time was taken up in

this work that their cotton was neglected and yields were generally smaller in consequence.

The Plant Breeding Section continued their work on the breeding of strains resistant to Leaf Curl. The incidence of the disease in 1931-32 at Shambat, where the Section is situated, was not serious and few infected plants showed severe symptoms, a fact which naturally made selection for resistance difficult. These strains have been grown also in the Gezira and have maintained their resistance. Their appearance this season was a striking contrast to that of the Gezira ordinary crop, in which Leaf Curl caused very severe shedding. It is expected that enough seed of two of the best of the resistant types will be available to plant 1,000 feddans with each of them in the coming season.

In view of the fact that financially the Sudan is practically dependent on cotton alone, the possibility of developing the production of other crops has been discussed. If effective action is to be taken in this direction, it would be desirable that officers of the Agricultural Department should include in their training some opportunity of gaining experience in the production of various tropical crops under rainfall conditions, such as is given to practically all men joining the Agricultural Departments of the Crown Colonies, by requiring them to spend a year at The Imperial College of Tropical Agriculture, Trinidad. Until the Government adopt such a scheme, the average quality of their agricultural officers will continue to suffer.

The Director of Agriculture has kindly supplied the following note, in which he gives the final output of cotton from the different districts in 1931-32 and tabulates the estimated yields from some of the districts for the current season at the time when his note was written (February).

Season 1931-32.—The following table shows the final yield of cotton from the various districts of production :—

TABLE I.

1931-32 YIELD.

SAKEL TYPE.

	*Feddans.	Yield in †Kantars.	Yield per Feddan in Kantars.	Calculated as bales of 400 lbs. lint.
GEZIRA.				
Sudan Plantations Syndicate Ltd. ...	174,788	705,686	4·03	167,600
Kassala Cotton Co.	19,191	99,365	5·17	23,599
Total ...	193,979	805,051	—	191,199
TOKAR	38,000	52,614	1·38	12,495
GASH DELTA (Kassala) ...	17,500	30,614	1·75	7,270
PUMPING SCHEMES	3,591	15,513	4·32	3,683
Total Sakel	253,070	903,792	—	214,647

AMERICAN TYPE.

	*Feddans.	Yield in †Kantars.	Yield per Feddan in Kantars.	Calculated as bales of 400 lbs. lint.
IRRIGATED.				
Pumping Schemes ...	10,653	43,670	4·09	9,825
RAIN GROWN.				
Southern Provinces.				
Kordofan (Nuba Mountains) ...	46,000 (Estimated.)	39,589	0·86	8,907
Upper Nile...	5,000 (Estimated.)	2,603	0·52	585
Mongalla ...	8,840 (Estimated.)	4,448	0·50	1,000
Northern Provinces ...	Nil	Nil	—	—
Total American ...	70,493	90,310	—	20,317

* 1 Feddan = 1·038 acres. † 1 Kantar = 312 lbs. seed cotton.

The sowing season in the Gezira in 1931 was a favourable one. The crop made an excellent start; Leaf Curl occurred but did little harm, and it appears that this disease is likely to be seasonal. Blackarm (*Pseudomonas malvacearum*) caused damage in certain areas, but good growing conditions continued and the final yield reached the satisfactory figure of an average of 4·15 kantars per feddan over the whole area.

The seed sown was newly imported from Egypt and was sunned and treated with a germicidal powder before sowing. Ratoons and volunteer seedlings were carefully sought out and, as far as possible, exterminated. To whatever extent these measures were contributory to the success of the crop, it is now evident that the main factor affecting the yield is the climatic one.

The 1932-33 crop was sown under unfavourable conditions of heavy rains. Consequently considerable areas were put in very late. The precautions taken in the preceding season, which are detailed above, were again followed, yet not only have Blackarm and Leaf Curl done very serious damage, but, so far, the season being a bad one for cotton, little recovery is taking place. A low yield per feddan is anticipated and the crop is likely to be below the average of those harvested hitherto.

Tokar and Kassala crops of 1931-32 were again good and, though both areas and yields were rather less than those of the previous season, the Tokar yield was again above the average. The Gash was sown with its own seed and Tokar with seed imported from Egypt.

In 1932-33 Gash seed has been used on both areas. Leaf Curl is again prevalent in both deltas, but it is difficult to assess the damage from this cause.

A decrease in the amount of American cotton produced in 1931-32, both in that grown under irrigation and in the rain-grown cotton, is mainly attributable to low prices, and this will be repeated again in the present season. Severe damage was caused by bollworm in Berber Province.

The following table gives the areas and some indication of the probable yields for the present season :—

TABLE II.

ESTIMATED YIELDS OF COTTON TO BE HARVESTED IN THE SEASON 1932-33.

SAKEL TYPE.

	Area in *Feddans.	Anticipated Yield in †Kantars.
GEZIRA.		
Sudan Plantations Syndicate Ltd. ...	175,792	—
Kassala Cotton Co.	19,183	—
Total ...	194,975	400,000
TOKAR	40,000	60,000
GASH DELTA (Kassala)	19,147	28,000
PUMPING SCHEMES	3,956	13,958
Total Sakel	258,078	501,958
AMERICAN TYPE.		
IRRIGATED.		
Pumping Schemes	11,435	40,830
RAIN GROWN.		
Southern Provinces.		
Kordofan (Nuba Mountains) ...	32,000	28,000
Upper Nile	1,800	1,500
Mongalla	9,425	5,000
Northern Provinces	Nil	—
Total American...	54,660	75,330

* 1 Feddan=1·038 acres. † 1 Kantar=312 lbs. seed cotton.

Kenya.

By far the greater proportion of the cotton crop from Kenya is produced in the Nyanza Province and in the Coast Province. The season 1931-32 was favourable in both districts. The total crop for the Colony amounted to 1,735 bales, a figure which is double that of the previous season. Moreover, there was an improvement in cultural methods, and the crop contained only a small proportion of second-grade cotton. This result was achieved in spite of some difficulties, especially in the Nyanza Province, where the agricultural officers were much occupied with locust destruction, and were thus able to give less time than usual to the supervision of cotton-growing. In the Coast Province successful attempts were made to secure the cutting out of old plants at an earlier date, thus securing a longer close season for the crop.

It was mentioned in last year's report that Kenya had obtained supplies of improved strains from Uganda, and these are being tested by the Agricultural Department. Seed from these tests will be available for distribution in time for the season 1933-34. Time of planting experiments have been carried out, and the present indications are that early plantings give the most successful results. The 1932-33 crop is expected to show a considerable increase on that of last year.

Uganda.

The season 1931-32 produced a crop of 195,000 bales, and would have been considerably larger but for bad weather in many parts in the latter half of the season.

The year was noteworthy for the fact that Pink Bollworm made its appearance in Uganda for the first time. Immediate steps were taken in the hope of retarding its spread into the

main cotton-producing areas. The district in which it appeared was closed for the export of cotton seed and seed cotton, and a five-mile belt, in which no cotton might be grown, was demarcated around the infected area. Nevertheless, it is reported that a considerable part of the Northern Province was infested.

The Department of Agriculture hopes that native cultivators may adopt some measures of control of the principal cotton pests, if they are assisted in the identification of them by means of large coloured plates in the schools. At the request of the Government, the Corporation have agreed to contribute £100 towards the cost of these plates, which are to be prepared in consultation with the Imperial Institute of Entomology.

In the Eastern Province, the selected strain of cotton, known as S.G.29, was grown on about 55,000 acres, and it is intended to spread this strain gradually over the whole Province. This season three segregated areas, comprising about 30,000 acres, have been declared in the Teso district with a view to safeguarding the multiplication of new varieties prior to their general distribution.

The botanical work in Buganda has included selection for resistance to Blackarm disease; two strains have been produced which show definite resistance, but neither is a high yielder, and work is being continued with a view to improving this property without impairing the power of resistance to Blackarm.

The use of motor transport for seed cotton, which has now become general, has given rise to some important agricultural problems. Cotton is now not infrequently bought at any distance up to 60 miles from the place where it is ginned. This fact at once increases the rate at which those pests or

diseases can be spread which are carried in seed cotton. This applies particularly to Blackarm and Pink Bollworm. Moreover, this carriage of seed cotton over considerable distances makes it increasingly difficult to keep any one strain pure, and the mixing of growths is becoming more frequent. Further, the more rapid marketing rendered possible by the use of motor transport has led to congestion at the markets themselves, and this congestion has made it more difficult to prevent the mixing of different grades of cotton, a practice which cannot fail ultimately to damage the reputation of Uganda cotton.

In spite of large crops and capable and unsparing work on the part of the officers of the Agricultural Department, there remains a certain feeling of uneasiness as to the future owing to the position with regard to the ginning industry. The excessive number of ginneries for the size of the crop has been mentioned more than once in these Reports. It has led to wasteful competition between ginners, which it is hoped, however, that the recent action of the Government as announced in the local press, in abolishing buying posts, in general, when they are situated within five miles of a ginnery, will do something to diminish.

In the current season, 1932-33, the Government urged cultivators to increase their acreage in order to compensate themselves to some extent for the low prices. The area planted is estimated at over a million acres, which is easily a record for the Protectorate. Up to the end of the year the weather was, on the whole, favourable; Blackarm was negligible, and damage from insect pests less than usual. At one period it was estimated that the crop might reach 275,000 bales, but heavy rains late in the season, particularly in Buganda, caused appreciable loss, amounting probably to some 10,000 bales. It is possible also that owing to the low

prices and the inclination of the grower to take advantage of the early rains for the planting of his food crops, a certain amount of the cotton crop may not be marketed on account of early uprooting. Even so, it appears certain that the crop will be the largest yet produced in the Protectorate.

Tanganyika Territory.

In last year's Report reference was made to the visit paid by Mr. Milligan to Tanganyika at the request of the local Government, to advise on measures for improving cotton-growing in the Territory. The Department of Agriculture have accepted Mr. Milligan's report in full, and are taking steps to give effect to the recommendations contained therein, so far as the financial position will permit. Mr. Milligan advised that the experimental work on cotton should be carried out by Agricultural Officers who were also engaged in the work of improvement of other crops in the Territory, and not by whole-time cotton specialists. At least two Agricultural Officers would be needed for the work, together with a relief for leave periods. These officers have hitherto included district work in their duties, but would be unable to do so in future as the experimental work on cotton increased. Two agricultural assistants would also be required, again with provision of a relief for leave periods, and the cost of maintenance of the experiment stations would necessarily be increased as their work expanded. Having regard to their financial position, the Tanganyika Government feel unable to bear the whole additional cost involved, and have asked the Corporation if they would contribute. The matter is being discussed fully with the Governor and the Director of Agriculture during their leave.

The work at the Experiment Stations has included variety trials, in which local cottons were tested against other types

supplied from the Corporation's Station at Barberton. Various rotations have also been tried to determine the best combinations of crops and the order in which they should be grown.

Cotton production in the Territory has declined considerably since the season 1928-29, when over 30,000 bales were produced, until 1931, when the output was little more than 11,000 bales. This drop, as in some other countries in Africa, is doubtless attributable to the low prices prevailing, which have given the grower an ever-decreasing return. In Uganda, however, the growers have responded to the stimulus supplied by the Government and have increased their cotton acreage in the hope of thus being able to compensate themselves for the fall in prices. There was a welcome recovery in Tanganyika also in 1932, and the crop was 50 per cent. larger than that of the previous year.

In the Mwanza district the crop fell considerably below the estimate for that area, and the loss was at first attributed to jassid attack. It was subsequently thought, however, that possibly the cause was white fly, and the situation is being carefully watched this season.

The crop in certain parts of the Eastern Province suffered very severely from damage by rats. Various control measures have been tried and advocated, and various bodies and other Departments have been consulted.

This season, in the Eastern Province especially, there has been a strong demand for seed, and the present position is satisfactory. The good results in Tanga last year augur well for increased production there also. Writing in February, the Department of Agriculture mentioned that the short rains appear to have merged into the long rains, and that the latter

might be curtailed. This is a new experience, and it was unknown whether the crop would be adversely affected.

As in Uganda, the number of ginneries is in excess of requirements. Moreover, a large number of buyers have come into the business and entered into competition with the ginneries. As the Director of Agriculture wrote in his last Annual Report, " This kind of thing has led to too many cotton buyers, too many ginneries, and in the end the producer pays." He calls attention also to the important fact that when prices are rising, buyers appear who have no real knowledge of the crop, and it takes only one season of ignorant and indiscriminate purchasing to undo the work of several seasons which has been directed towards improvement in quality. As in Uganda again, the use of motor lorries by buyers has made matters worse; they buy cotton over a wide area with the consequent risk of good and bad cottons becoming mixed. The Government have recently worked out a scheme of district zoning and also ginnery zoning with a view to overcoming the principal difficulties connected with cotton collection, ginning and marketing. It is to be hoped that the plan will work satisfactorily, since some control measure of this kind would seem to be in the interests of the industry.

Nyasaland.

The area in which cotton-growing was encouraged by the Government was further restricted in 1932, owing to the continued fall in prices. In the previous year the Government had given a subsidy of ¼d. per lb. in those districts in which the British Cotton Growing Association were only able to pay the same sum, thus making the price up to ½d. in those areas. In the 1931-32 season cotton-growing was only encouraged in the Lower Shire and Chikwawa areas,

where a price of $\frac{5}{8}$d. and $\frac{1}{2}$d. per lb. respectively had been paid in the previous year. In view of the fact that the Government was unable to continue its subsidy, cotton-growing in other parts of the Protectorate was not encouraged. An exception was made, however, in the case of the Lisungwe area, which was used as a special reservoir for the multiplication of U.4 seed. No prices were guaranteed, but growers were informed that it was hoped that the prices of the previous year would be maintained.

In spite of these circumstances, the demand for seed was far greater than had been expected, which made it impossible to replace Nyasaland Upland completely by U.4, as had been hoped. The quantity of seed cotton produced in the Lisungwe area, where the latter strain was being bulked, was disappointing, and it is understood that this was largely due to a delay in the issue of seed. Steps were taken, however, to ensure that this did not recur and an ample supply of the U.4 variety was available for the current season.

The desire to obtain seed, even without any guaranteed price and with a probability that no more would be paid than in 1931, showed that the native cultivators in Nyasaland were anxious to grow cotton at a lower price than was thought likely, and the crop for 1931-32 far exceeded the original estimate; indeed, it was larger than in the previous year, in spite of the restricted area. This result is probably mainly to be attributed to the high yields obtained with U.4, which are giving great satisfaction to growers. Moreover, it is reported that a very high percentage of the crop is of first grade.

A general review of the work of the Corporation's staff in Nyasaland appeared in the Empire Cotton Growing Review for July, 1932, in an article by Mr. H. C. Ducker.

In that article the principal cotton-growing areas of Nyasaland are classified under their altitudes, the time of year at which the crop ripens in each is indicated, and the general scheme of distribution of U.4 seed for the whole country is explained. In the current season U.4 seed has been distributed throughout the whole of the present restricted area and, in the meantime, further selection work is being done on it with a view to improvement in its lint quality. This work is being carried out at the recently opened Domira Bay Station, where the Corporation's plant-breeding work is now concentrated.

In his report on the work of the Cotton Stations in the past season, Mr. Ducker describes the Domira Bay Station and the scope of its work as follows :—

> " The Domira Bay Station is admirably situated from nearly every point of view. It is close to railhead on the new railway now under construction, and to what is to be the main port of call for the Lake Nyasa steamers. It is approximately half-way between Port Herald and Karenga, the most widely separated of the Nyasaland cotton areas, and, to the west, the rich plateau areas of central Angoniland are within easy reach of the Station.
>
> " Conditions on the Station itself are those of summer crop cotton, sown early in the rains; but, within a distance of ten to twelve miles only, are areas where cotton may be sown in the middle of the rains, as a semi-summer crop, and after the end of the rains as a winter crop. The immediate neighbourhood of the Station, in addition to providing conditions for experimental work, the results from which may be applied to the whole country, is also admirably adapted to development as a seed-multiplication area."

Mr. Ducker is of opinion that the Lake Shore areas provide the safest, and in most seasons the best, conditions for cotton-growing in the country. Very high yields have been obtained at the Domira Bay Station, and these on land which is by no means the best in the area. The standard of cultivation, moreover, is one which is easily attained by ordinary native practice, and there are several thousand acres of suitable land on the line of the new railway. The one essential that was lacking at the Station was a good water supply, and this was provided at the end of last year, when a bore hole was made and a satisfactory supply found at a depth of about 100 feet. The Government have since made other bore holes also in native village areas in the neighbourhood.

As a part of this reorganisation of the Corporation's work, terms have been agreed upon with the Government whereby the Station at Makwapala, which was formerly the headquarters of the Corporation's operations, will be handed over to the Department of Agriculture from the beginning of 1935, for use as a district station and agricultural school. Such cotton work as continues to be done there will, however, still be under the general direction of Mr. Ducker.

The extension of the railway to Lake Nyasa, when completed, will bring all the present and potential cotton areas within relatively easy reach of main-line communication with the coast. How far cotton-growing can then be extended will depend largely on the price of the commodity and on freight rates. Railway extension is expected to reach a point near the South-West arm of the Lake this year, and seed issues for the current season have therefore been extended as far North as that point in districts lying within 15 to 20 miles of the new railway. If the present price can be maintained, it is hoped that the Domira Bay area itself may also be reopened for commercial cotton-growing in the following season.

When this Report was prepared, the seed issue for the current season had not been completed, but, as far as any estimate was possible, it seemed not unreasonable to anticipate an increase of at least 50 per cent. on last year's crop, if the conditions of the season are favourable.

Nigeria.

The Director of Agriculture's final report on the season 1931-32 substantially confirmed the forecast that he gave in this Report last year. The total amount of cotton purchased for export amounted to no more than 6,268 bales—only one-third of the output of the previous season, and the lowest figure for many years.

While the low prices that have prevailed during the last two or three seasons have undoubtedly contributed to this set-back, its main, though indirect, cause was the invasion of locusts in 1930. In that year the guinea-corn crop was so severely attacked that the price rose considerably, and the native cultivators anticipated similar or even greater damage in 1931 with still higher prices in consequence in 1932. Food crops were therefore substituted for cotton over a considerable area. It so happened, however, that the destruction of locust hoppers in 1931 was very effective and the damage done by them unimportant. The price of food crops did not rise, therefore, as was anticipated, and the natives found themselves with practically no market for any grain produced in excess of their own requirements. In these circumstances a larger area of cotton has been planted this season (1932-33).

Last year the total quantity of cotton produced was undoubtedly considerably greater than that purchased for export; but when the acreage is low and food crops have been substituted for cotton, the local hand-weaving industry always enters into active competition with the exporter. Last season

it appears that practically all the cotton grown in some districts in the North was bought in the local markets, either for hand-weaving or for export into French territory. As regards the cotton purchased in Nigeria for export, the Director of Agriculture considers that the grower, on the whole, obtained quite a fair price for his crop and was probably satisfied.

The quality of the crop was lower than usual, the climatic conditions during the season having contributed to make the lint short and weak in the Northern Province. In the South the amount of Ishan cotton grown was less than in the previous year, and the new grading regulations that were in force, which were similar to those in Northern Nigeria for Allen cotton, reduced considerably the percentage passed as first grade.

It was mentioned last year that at the Corporation's seed farm at Daudawa 20-acre blocks of four selected strains supplied by the Agricultural Department were planted for comparison of their yields: none of these, however, gave a result that warranted further multiplication of the seed.

The botanists have carried out tests with the U.4 variety and selections from it. The original U.4 bulk gave no better yield than the ordinary Allen variety now grown in the North, and its quality was slightly inferior. A selection of U.4 made in Southern Rhodesia is, however, receiving further trial.

The Department of Agriculture are convinced that great advantages to the native will follow the development of mixed farming, that is to say, using cattle for cultivation and systematically making and using farmyard manure. In this connection the attention of readers of this Report is invited to the article by the Director of Agriculture in the Empire Cotton Growing Review for January, 1933, in which he

describes the progress made and the beneficial results on native agriculture generally—and hence on cotton production —that may be expected when this system of farming becomes more general.

Representations have been made to the Corporation by the Government to the effect that by consenting to a modification of the functions of their seed farm at Daudawa, they could render valuable assistance in the development of this aspect of the Government's agricultural policy. Hitherto the purpose of the seed farm, which was started at the suggestion of the Government in 1925, has been to multiply rapidly reasonably pure lines of seed supplied by the Agricultural Department. At the present time this work is less important than it was, partly because the Department have not produced any selection or new strain that is markedly superior to the type now grown, thus making rapid multiplication less urgent, and partly because the low prices have brought about an inevitable reduction in the demand for seed from the native cultivators. The Director of Agriculture considers that in these circumstances the best service that the seed farm can render is by helping forward his Department's scheme for promoting mixed farming, by demonstrating the best methods of growing cotton as part of such a system, and by carrying out trials of various rotations and methods of intensive cropping.

The Department would also like to see an extension of the tenant farmers' scheme on the land set apart for extension of the seed farm, and they proposed that the area should be let out by the Corporation to farmers, who would pay a fraction of their crops to the Corporation by way of rent. This proposal appeared to the Corporation to involve questions of land tenure, which they considered could only properly be handled by the Government themselves. They

are, however, anxious to make the seed farm as fully useful as possible to the Department in their new policy, and they have accordingly appointed Mr. H. C. Jefferys to visit Nigeria in order that he may discuss with the Government representatives on the spot possible alternative methods of giving effect to the policy that the Agricultural Department have in view. Mr. Jefferys was formerly Director of the Agricultural Service of the State Domains in Egypt, and subsequently Manager of the Sudan Plantations Syndicate's seed farm in the Gezira. It will be remembered also that he accompanied the Director and Mr. Addison on their first visit to South Africa in 1927. The Corporation are looking forward to receiving from him recommendations as to the manner in which they can best co-operate in this matter with the Department of Agriculture, whilst not overlooking the original function of the seed farm and the necessity for being able to multiply and retain the purity of seed for distribution to native cultivators.

This season, 1932-33, in the Northern Provinces the demand for seed exceeded the supply available, owing to the small acreage planted last season; the Agricultural Department do not believe, however, that planting was seriously restricted, but that the seed was probably used more economically than usual. It is unfortunate that a prolonged drought caused a large proportion of the crop to be planted late, otherwise conditions were generally favourable at the beginning of the season, and a yield above the average might have been obtained.

The new L strain, which is slightly but definitely better than the present ordinary seed, both in respect of quality of lint and of ginning outturn, has done satisfactorily this year; it will be further multiplied next year, and cotton of this strain will then become available in commercial quantities.

The Agricultural Department expect that purchases for export of cotton grown in the Northern Provinces this season will amount to about 25,000 bales. In the Southern Provinces only small purchases are looked for unless the price rises considerably.

Gold Coast.

The Agricultural Department report that in the Northern Territories the yields will be below the average. In Tamale district the plots to the East suffered from a severe and prolonged drought at planting time. In Togoland the yields from Ishan cotton at the Kpeve Investigational Station had been very satisfactory up to the end of February, and picking was not then completed. Yields from cotton seed farms had been below the average of the previous year, while apathy, induced by a preference for cacao as an export crop, would probably diminish the cotton output from Togoland this year

West Indies.

Reference was made last year to a Conference, held at the instance of the Empire Marketing Board, to consider the difficulties in the disposal of their crops that confront growers of Sea Island cotton. Arising out of that meeting, a further Conference was held in Barbados in April of last year, at which representatives of the principal cotton-growing islands were present, together with the Commissioner and Assistant Commissioner of Agriculture for the West Indies, and Dr. Harland, who since 1930 has been permitted by the Corporation to act as Cotton Adviser to the Commissioner. The unanimous findings of the Conference included recommendations of a drastic restriction of acreage, the introduction of a system of standard grades, and the formation of a West Indian Cotton Growers' Association. In his report

on his visit to the West Indies made last year, the Agricultural Adviser to the Colonial Office recommended that such an Association should be responsible for standardization of the quality of cotton exported, and quota restrictions where necessary. A local branch of the proposed Association has since been formed in St. Vincent, and branches are in course of formation in Barbados, Montserrat and St. Kitts.

A difficulty as regards restriction of acreage is that whereas some islands can produce alternative export crops, such as sugar in Barbados and arrowroot in St. Vincent, others are almost entirely dependent on cotton, and it would appear that the economic conditions in each island must determine the extent to which restriction of the cotton acreage is possible.

The Conference also proposed that a London Board should be formed to further the sale of Sea Island cotton, and this and other measures advocated have been considered at another meeting convened by the Empire Marketing Board. At this meeting it was agreed that there was no need to establish a new and expensive body for this purpose alone, but that a Board might be appointed to work in conjunction with the West India Committee to promote the sale of Sea Island cotton goods.

The work at the Cotton Station, St. Vincent, which is under the direction of the Corporation's officer, Mr. Evelyn, has been largely directed towards the purification of the seed supply for the Island. Multiplication of pure Superfine Sea Island proceeded satisfactorily, and this is the only kind of cotton that is being grown this season in St. Vincent. The seed stocks will be renewed from pure seed next season, and it is hoped to continue this system of maintaining a carefully controlled pure seed supply. The results of spinning tests

on this Superfine cotton were highly satisfactory and show that the work of intensive selection carried out in the last two years, since the Cotton Station in St. Vincent was re-established, has restored the former standard of purity.

Work has been continued with Moco cotton from Brazil and seed should be available this year for distribution in the drier Grenadines. This type of cotton has shown itself to be superior, both in yield and quality, to the kinds at present grown in those Islands.

Various hybridization experiments arising out of the work of Dr. Harland at the Research Station, Trinidad, have been carried out by Mr. Evelyn at the St. Vincent Station. These include crosses made with a view to improving U.4 cotton obtained from the Corporation's Station at Barberton, Transvaal.

In Montserrat, the steps that were taken last season on the advice of Dr. Harland have proved satisfactory as a means of improving the purity of the seed supply. It is much to be hoped that the standard of quality will be carefully maintained, since cotton exports represent nearly 70 per cent. of the total value of the Island's exports.

The following notes on the last cotton season are taken from information kindly supplied by the Commissioner for Agriculture, who has been good enough also to furnish the production figures given in the table on page 49.

The season 1931-32 (1932 in the case of Montserrat and St. Kitts, where the planting and the picking seasons fall within the same calendar year) was, on the whole, wetter than usual, and cotton was somewhat affected by the unfavourable weather conditions. Insect pests and diseases were not

the cause of great losses. On the whole the purity of the cotton has been well maintained.

The depressed condition of the market for Sea Island cotton was responsible for a considerable decrease in the area planted. According to the figures returned, the area in Sea Island is about 5,000 acres, as compared with some 15,000 in the previous season. This latter figure is very high and is largely due to an increase in acreage in Barbados in 1930-31 and in Montserrat in 1931. The area of Marie Galante probably remains constant.

In St. Vincent insect attack was very slight throughout the year. Towards the latter part of December, 1931, and in early January, 1932, high winds and heavy rains caused damage, while on one estate, wind, combined with spray from the sea, damaged foliage to such an extent that it turned black, and a somewhat high percentage of external boll disease was caused.

In Montserrat the area planted to cotton was much reduced in 1932, being only 1,500 acres, against 3,425 acres in 1931. A good crop was produced, though the rainfall was scanty in the beginning of the season. In general, the purity of the Montserrat crop was quite satisfactory, only on one estate were a few off-type plants found. Seed from this field has been carefully watched and none of it will be planted.

In St. Kitts, owing to large stocks of unsold cotton in England, the area planted to cotton in 1932 was only about 200 acres. The cotton was reaped before the storm of 26th September. The purity of the cotton in the field was satisfactory, very few off-type plants being observed. In future only one type of cotton is to be grown in St. Kitts, *i.e.*, a long, very fine lint.

COTTON PRODUCTION FIGURES.

Island.	Lbs. of lint.	Year.
Grenada	349,328	1931–32
St. Vincent	S.I. 209,505 M.G. 69,956	1931–32
Barbados	73,150	1931–32
Montserrat	*187,131	1932
Antigua	35,354	1931–32
Nevis	23,737	1931–32
St. Kitts	35,140	1932
Anguilla	26,141	1931–32

S.I.=Sea Island. M.G.=Marie Galante.
* 17,640 stained.

Cyprus.

Notwithstanding the fact that the Agricultural Department estimate that the area suitable for cotton cultivation in Cyprus amounts to about 50,000 acres, of which 33,000 acres are suitable for growing non-irrigated cotton and the remainder suitable for the crop under irrigation, the island is not at present an important source of Empire supply. In recent years there has been a decline in the output; this is attributed to low prices, the rapid extension of fruit-growing, and the limited supply of irrigation water that can be utilised for cotton production. In addition, the methods of cultivation and subsequent handling of the crop are below the standard of the methods now followed in the leading cotton-producing countries. If these methods could be improved, the Department of Agriculture are of opinion that a more remunerative market would be open to cultivators, and in that event the production might be very greatly extended. Climatic and soil conditions are favourable for cotton-growing within the area indicated.

The following note on the season of 1932 has been supplied by the courtesy of the Department of Agriculture :—

There was an exceptional drought during the year 1932, and consequently the area of cotton planted and the amount of seed produced during that year is the lowest on record. As well as a reduction of the area planted on non-irrigated lands, the area planted under irrigation was also much reduced, due to the shortage of available irrigation water on account of the failure of the rains. The average total rainfall during the year 1932 was only 13·42 inches. The average for the whole Island for the last ten years is 20·47 inches.

The area and production for the last five years is as follows :—

Year.	Acres.	Lbs. Seed Cotton.	Yield : lbs. per acre.
1928 ...	11,150	2,862,151	257
1929 ...	11,190	4,693,511	419
1930 ...	18,700	6,371,646	340
1931 ...	11,300	3,789,606	336
1932 ...	6,300	1,592,960	253

The difference in yield per acre is mainly due to the variation in the total area of irrigated cotton grown in any one season as compared with the area of non-irrigated cotton.

The above statement of area and production is of particular interest, as the highest and the lowest area and production since the British occupation are recorded during the years 1930 and 1932 respectively.

The following cotton experiments were carried out during the year :—(*a*) Date-of-sowing trials, (*b*) comparative trials with chemical fertilizers of certain types commercially used in Cyprus, (*c*) spacing experiments, (*d*) trials with imported varieties.

A report on the above experiments was published in the *Cyprus Agricultural Journal* for December, 1932.

As climatic conditions are again more normal the prospects for the 1933 crop, as far as can be foreseen at present, indicate that an average area will be planted. The actual area of irrigated cotton will depend on the sufficiency or otherwise of irrigation water available during the summer months.

Iraq.

The Department of Agriculture have kindly supplied the following note :—

As was forecast last year, the areas under cotton in the year 1932 were again considerably curtailed. Only 17 tons of seed were issued, since growers were discouraged by prices and were generally experimenting with alternative summer crops which promised better financial returns. Sesame was popular, as experience of the previous year showed a remunerative price in Palestine and Syria.

The season was, on the whole, not favourable to the cotton crop. Germination was difficult and poor, due to low temperatures at the time of sowing (March 15th-April 15th), and re-sowings were necessary. The early summer months were marked by a series of dust storms of unusual frequency and intensity. Cotton, as well as other crops, suffered badly, and these unusual meteorological phenomena culminated in what was practically a continuous dust storm throughout the whole of July. First flush pickings were poor in quality and quantity in consequence. With the month of August weather conditions became more normal. New bolls were set and an open autumn gave a chance for these to mature. Very

sudden frost early in December, however, put an end to picking, leaving a good deal of nearly mature, but as yet unopened, cotton on the plants.

The total crop delivered to the two ginneries by the end of December corresponded to 409 bales only.

Prospects for this season are no brighter. At present cotton prices cultivators are not attracted by the crop, which requires considerable labour and gives rather uncertain yields. As this report was written before seed issues had begun there were no data on which to form an estimate, but there would appear to be no reason why areas under cotton should be increased.

Ceylon.

The following account of cotton production in the season 1931-32 is taken from a letter recently received from the Director of Agriculture :—

The growing of cotton under peasant conditions has received a further setback since the last report was written. This was due mainly to the low price paid for the previous crop, while other economic factors also tended to diminish the desire for cotton-growing, with the result that the crop was only a small one last year in the Hambantota district. There is evidence, however, of a little interest in other parts. The fact that spinning has been taken up as a peasant industry was responsible for a part of the crop not being sold to the Agricultural Department under the cotton-purchase scheme as hitherto, and in some cases cultivators negotiated direct with buyers. There is no record of the quantity so disposed of. The quantity dealt with by the Department on behalf of cultivators was a little over 75 cwts. of seed cotton,

and that grown on experiment stations was just above 125 cwts., making a total of 200 cwts. seed cotton which can be accounted for. The price paid by the Colombo Spinning and Weaving Mills, who have been the purchasers of all local cotton hitherto, was Rs.2 higher than last year's figure. The variety grown, namely Cambodia, gave an average yield of 4 to 5 cwts. an acre in peasants' cultivation. On one of the Department farms a yield of 10 cwts. an acre was secured in the year under review.

Fiji.

During the past year the period for which Mr. Anson, the Corporation's officer in Fiji, was appointed came to an end, and the question of the extension of his contract had to be considered. In spite of the excellent work that Mr. Anson has done during the six years that he has been in Fiji, the Corporation felt that the Islands were never likely to produce any considerable quantity of cotton within the near future, and it appeared to them desirable, in the present economic conditions, to concentrate their efforts upon those countries from which the output was likely to be of greater importance. They therefore decided to extend Mr. Anson's appointment, but for one year only, to enable him to have more time in which to bring the new hybrid cotton, on the breeding of which he has been engaged, to a point at which small quantities for export could be produced. This hybrid cotton has many promising features, and it was unfortunate that its production received a severe setback owing to the hurricane referred to in this Report last year. When the Corporation's decision was intimated to the Fiji Government, they put forward a proposal that the extension of Mr. Anson's engagement might be continued for a further year, during which period they would be prepared to pay half his salary,

and to this suggestion the Corporation have willingly agreed. It is hoped that Mr. Anson will thus be able, by the time that his service in Fiji comes to an end, to hand over to the Agricultural Department sufficient seed of the new hybrid for distribution among native growers.

Mr. Anson is of opinion that it is the Fijian rather than the Indian who will become the cotton cultivator of the future. For this reason importance is attached to the fact that the new transinsular road should be open this year, as this would make it possible to open up fairly large areas of Fijian-owned land that have been inaccessible hitherto.

Reference was made last year to the scheme for the agricultural training of Fijians. The supervision of this scheme has been handed over to Mr. Anson and his staff; six new centres have been opened and it is hoped gradually to bring into cultivation most of the land owned by Fijians that has been lying idle. In pursuance of this policy an increased amount of the work of the Cotton Station has been directed to crops to be grown in rotation with cotton, and the experiments so far have indicated that certain crops undoubtedly have a beneficial effect on the yield of the following cotton crop.

The work of breeding the new hybrid cotton, which it is hoped will be comparable to Sakel, is progressing satisfactorily, many of the selections now breeding true to type. A certain quantity has been sent home for further testing of its spinning quality on a small commercial scale.

This year, owing to the losses sustained in recent years and to the very limited market for Sea Island, which is the type that has been grown in the past, the Government have decided to suspend cotton-growing in commercial quantities for one year. During the current season, however, the new

hybrid will be multiplied on selected Fijian farms and Sea Island, which is grown principally by Indians, will be planted in a few small areas so as to maintain the supply of seed. In the season 1933-34 it is proposed to re-establish cotton-growing on a commercial basis, with the new cotton in the semi-wet areas, grown chiefly by Fijians, and with Sea Island in the wet areas, grown principally by Indians.

Mr. Anson appears to feel a little doubtful as to the effect on the Indian peasant of this suspension of cotton-growing for a year. It may be that with the break in the continuity he will be reluctant to return to cotton-growing; but, on the other hand, it is equally likely that he will clamour for the crop when he cannot get it and look after it better when the seed is supplied once more. Some storekeepers and land-owners are complaining, owing to the fact that growers will have no cash crop this year, and this, by causing attention to be directed to the importance of cotton, may result in a fairly large acreage being planted next year. The Government feel that their decision to suspend cotton-growing this year is entirely in the interests of the cultivators and that if the latter can take up some alternative crop for one year a profitable revival of the cotton-growing industry in Fiji should be possible.

In the season 1931-32, although the actual rainfall was at no time excessive, continuous dull and sultry weather encouraged boll rot, and the final yield of seed cotton per acre was one of the poorest on record. The low prices obtainable for cotton also caused a decrease in the area, rice being to a large extent substituted for cotton. The quality of the small quantity that was grown compared favourably, however, with that of the last few years, the staple being stronger, longer and finer and less neppy, while the colour was good also.

As already stated, in the current season commercial cotton-planting has been suspended. Only multiplication plots of the new hybrid are being grown, with a few small areas of Sea Island for seed.

Research.

Research Station, Trinidad.—During the year the Corporation have issued Memoirs 3, 4 and 5 of the Genetics Department. These consist of papers by Dr. Harland, Mr. Hutchinson and Dr. Skovsted, two of which appeared in the *Journal of Genetics,* and the third in the *Annals of Botany.*

A paper by Dr. Mason and Dr. Phillis, of the Physiology Department, has been accepted for publication in the *Annals of Botany,* and will be issued subsequently by the Corporation as one of the Memoirs of the Trinidad Station.

Mr. J. B. Hutchinson, who has been Assistant Geneticist at the Station since 1926, has recently resigned on appointment as Geneticist and Botanist at the Institute of Plant Industry, Indore. The Corporation much regret the loss of Mr. Hutchinson's services in Trinidad, but the improvement of the Indian varieties of cotton, upon which Mr. Hutchinson will be largely engaged in his new post, is of so great importance in connection with the possibilities of their use by Lancashire in increased quantities that the Corporation have reason to hope that they may continue to benefit from the work on which Mr. Hutchinson will be employed in India.

Genetics Department.—Dr. Harland has sent the following summary of the year's work :—

The past year's work of the Genetics Department has been marked by considerable progress. Further crosses of New World cottons with wild species have been made, and Dr. A. Skovsted has recorded partial fertility on the male side in crosses of Sea Island by *Erioxylum* (*Gossypium*) *aridum*, a wild species from Mexico. The introduction of *Erioxylum* genes into New World cottons may have an important agricultural bearing.

The cross between cultivated Asiatic and New World cottons mentioned in last year's Report has been further studied. Back-crosses to Upland U.4 have been made and plants are now under observation which are virtually fertile combinations of Upland and Asiatic. Their commercial value is not yet known and considerable cytological study must be made on them before extended trials can be made. It is clear, however, that the introduction of genes from Asiatic to New World cottons is practicable.

A paper on the cytology of Triploid and Diploid Asiatic cottons has been written by Dr. A. Skovsted, and appeared in a recent number of the *Annals of Botany*. Mr. J. B. Hutchinson has published a paper in the *Journal of Genetics* which contains a study of the inheritance of anthocyanin coloration in Asiatic cottons.

Studies in the cytology of wild and cultivated species of cotton are in progress, and many data have been accumulated on the mode of inheritance of many characters in both Old and New World cottons. A monograph on the *Genetics of Gossypium* has been written by Dr. S. C. Harland for *Bibliographia Genetica*.

The hybridization experiments arising out of Dr. Harland's work, that are being carried out by Mr. Evelyn in St. Vincent under Dr. Harland's supervision, have been already mentioned in the section of this Report dealing with the West Indies.

Physiology Department.—The following report has been supplied by Dr. Mason :—

In last year's report reference was made to work on the carbohydrate metabolism of the cotton plant. This work has been concluded and an account of it will shortly be published. It was observed that the factors responsible for the expulsion of sugar from the green leaf are different from those that ensure transport along the stem. Transport out of the leaf, like traffic in a one-way street, is polarised, while that along the stem is not. At present we are studying the mechanism whereby the mineral elements are re-exported from the leaf, and also the factors that lead to the removal of food materials from the corolla of the flower prior to its abscission. The problem of longevity and fall of these organs appears to be intimately associated with the backward translocation of food materials to the stem. It is hoped that this line of enquiry may also offer some clue to the causes of boll shedding.

Experiments have also been made on the succulence brought about by excessive supplies of nitrogen, to which American cotton, cultivated in the humid Tropics, appears to be especially susceptible. Two important factors have already emerged; firstly, that high nitrogen supply may lead to a great deal of bud and boll shedding and, secondly, that the nitrogen economy of the green plant may not be as efficient as is generally assumed, for appreciable losses of nitrogen have been registered from the leaf into the atmosphere. We have also observed that the nitrogen content of cotton seed may be greatly affected by nitrogen supply.

We have carried out several experiments on the formation of storage deposits of mineral elements in the plant during vegetative growth and their subsequent utilisation by the boll. We have found that the stem accumulates reserves of many, but not all, the plant food materials, even though the leaves of the plant may be dying from starvation, but that these reserves are utilised when bolling sets in.

Experiment Stations.—The annual volume of Reports received from Experiment Stations was issued in February. Following the practice of last year, four only of the Stations, taken in rotation, were called upon to supply full reports, while the remainder sent summaries of the principal results obtained. The full reports this year were those from Northern Rhodesia, Nyasaland, Nigeria and Fiji. A general review of the subject matter of the reports was contained in a preface to the volume by Dr. Willis, in which he describes in non-technical language the principal directions taken by the work and the main results achieved. In plant breeding, the work in the Union of South Africa and in Rhodesia is concerned with selection of strains of U.4, while in Nyasaland attempts are being made to improve the quality of the U.4 lint by crossing with other strains. Some experimental breeding was also done in Nyasaland and elsewhere with strains supplied by the Corporation's Research Station in Trinidad.

In the Sudan the breeding work was concentrated on attempts to produce strains which would be resistant to Blackarm and to Leaf Curl, while in Uganda the Department of Agriculture are carrying out selection work on local varieties.

At all Stations experiments are being conducted on various rotation crops with a view to deciding on the best rotation with cotton in each locality.

In South Africa and in Rhodesia considerable attention is being devoted to methods of control of the principal insect pests, namely, bollworms and stainers.

Home Universities and Institutions—Cambridge University.—Less than ten years ago there was not in this country, nor in the Empire at large, a single centre at which advanced training in agriculture and the agricultural sciences was provided. Such partial provision as existed failed to meet the needs in a number of major scientific branches and entirely left out training for work in the tropical Colonies and other cotton-growing countries.

It is an historic fact—not widely known—that the present extensive scheme for preparing men for tropical agriculture, now firmly linked with the work of the Imperial College of Tropical Agriculture in Trinidad, originated in and has ever since been substantially promoted by the help of the Corporation. During the past year several of the important extensions of scientific Departments in the University, Agriculture among them, have been completed, or nearly completed, and readers may therefore be glad to have an account of them.

Cotton-growing is a part, often a highly-important part, of the agriculture of several British territories. In a broad business view, therefore, the training of all probationers for tropical agriculture has a direct bearing on Empire cotton-production. The probationers, as a body, need facilities for advanced study in the actual practices of crop and stock raising, in combating diseases carried by insects, fungi, bacteria, and viruses, in all matters connected with soils, in plant physiology (*i.e.*, the growth of plants), in genetics (*i.e.* plant and animal breeding), in the economics of agriculture, and in animal nutrition. These wide facilities are made

possible by special courses at the School of Agriculture, coupled with the advanced courses of the various Schools of pure science in the University.

The chief extensions under the Rockefeller benefaction by which training for Colonial Agriculture, including that for men specially destined for work on cotton, will benefit, are briefly as follows. A Department of Colloidal Physics has been created which affords advanced teaching in colloidal science and facilities for research. In Plant Physiology and Mycology (including Bacteriology) the existing facilities and staffs have been much increased and a large new building is shortly to be erected. For Entomology (insects and diseases caused by them) there has been formed, in the University Department of Zoology, a complete sub-department. This, like Mycology and Plant Physiology, has been provided with a field station, all these stations being on land forming part of the University Farm of 700 acres, on which all the outdoor work of the Department of Agriculture, both teaching and research, is carried out. The University Department of Physiology benefits by a big addition to its laboratory (now half completed) and by added resources for research.

The School of Agriculture will in a few weeks enter into its new additional building of four storeys, each with an area of approximately 3,800 square feet. This is of modern design, specially planned for research work and advanced teaching. It includes laboratories for advanced teaching in statistics and cytology (an important branch of plant breeding), extensive accommodation for economics, and for much biological work. Here, too, will be housed the Imperial Bureau of Genetics, to which cotton workers all over the Empire apply for information on genetic literature. Fresh posts in cytology and soil science and resources for other forms of research accrue also.

Including a large part of the cost of the vast new University Library, with nearly fifty miles of shelves, the Rockefeller Benefaction to the University amounts to £700,000. To this are to be added contributions made in this country for the fulfilment of the scheme, which bring the total to £1,179,000.

Manchester University.—In the Mycology Department the work during the year was mainly connected with the physiology of a Black Mould (*Aspergillus niger*), isolated in pure culture from cotton bolls. In the bio-chemical part of this research the mycologist had the advantage of co-operation with the botanical staff. This work was temporarily interrupted by the appointment, in October, 1932, of the member of the staff in charge of this investigation to a lectureship at the National University of Ireland; but it is now being continued, both at Dublin and at this University. Arrangements have been made for the continuance of mycological work during the remainder of the year by the appointment, in November, 1932, of a member of the botanical staff as Supervisor of Cotton Mycology, and in January, 1933, of a temporary research assistant, who is investigating the cytology of the fungus *Melanospora Zamiæ,* isolated a few years ago from diseased cotton, and already investigated as regards its morphology by a former cotton mycologist.

In the Entomology Department experiments have been carried on during the past season on the oviposition of *Dysdercus howardi,* one of the cotton stainers, and on the effect of humidity on the hatching of the egg of this insect.

Experiments to find the effect of sudden variations in temperature on the life-cycle of *Thrips tabaci* were also performed.

During the summer of 1932, the life-history of an egg parasite of the jassid (*Erythroneura pallidifrons*) has been worked out, and it is hoped that an account of this will be published shortly. A paper, " The Biology of *Erythroneura pallidifrons* Edwards," was published in the March number of the *Bulletin of Entomological Research,* 1932.

Imperial College of Science and Technology.—The work on the interaction of cultural factors and the yield of cotton, which has been carried out in the Sudan in collaboration with the staff of the Imperial College, has recently been published. A study was made of four controllable factors:—Sowing (four sowing dates), amount of water (light, medium, heavy), spacing of the plants (close, medium, wide), and nitrogen application (with and without ammonium sulphate). The experiment occupied an area of 10 acres, consisted of 288 plots and was repeated in two consecutive years. The results show very clearly that no factor is " limiting " at any one time, but the effect of each factor is dependent on the level at which the others are maintained. Thus the effect of increasing the water application is very small unless nitrogen is also supplied. In addition, the factors of water, nitrogen and spacing show marked interaction with sowing date. The experiment has demonstrated that, by a suitable adjustment of the level of the factors, one may establish in a single season the limits between which the yield of a crop may be improved or controlled.

Work on the behaviour of the fungus (*Nematospora gossypii*), which causes internal boll disease, has been continued. As stated last year, this fungus shows certain peculiarities of growth since it will not develop on a synthetic medium but requires the addition of two accessory substances, which presumably it finds in the cotton plant. One of the substances is inositol, and an attempt is being made to

discover more exactly the part it plays in controlling the growth of the fungus. Concentrations of the other substance have been made which are active in doses of one milligram per 100 c.c. of medium, but attempts to purify the material further have led to loss of activity.

Rothamsted Experimental Station.—Dr. Keen and the staff of the Physics Department have continued work on the physical properties of tropical and sub-tropical soils. Rapid tests have been devised, which can be easily carried out in large numbers, even with the simple facilities available in remote laboratories. The numerous possible forms of such measurements have been carefully examined to see how far they are measuring separate and independent physical properties, so enabling a choice of measurements to be made giving the maximum total information with the minimum number of different tests. The ever-growing importance of soil surveys and classification—not only on virgin areas about to be cropped, but in regions already under cultivation—has stressed the need for simple laboratory measurements to give precision to the general conclusions arrived at from the soil survey. The measurements include the " heaviness " of the soil (in the agricultural sense), its relationship to water, and its inherent fertility; they are already being used in various overseas areas. The methods will not be described here, but information will gladly be sent to those interested.

In the Chemistry Department work has been continued under Dr. E. M. Crowther on the decomposition of crop residues of different types in relation to the liberation of their plant food for succeeding crops. The main experiments are being made on the effects of clover, rye-grass and fallow before wheat in the Rothamsted field experiments, but some preliminary experiments have also been made on soils from the rotation cotton plots of the Gezira Research Farm, Sudan.

Further statistical analyses of cotton yields at the Gezira Research Farm have confirmed Dr. Crowther's findings in 1925 that high yields of cotton occur in years of low early rainfall and *vice versa* for the standard three-course rotations, but not for certain two-course rotations. It is not clear how far these effects, if general, are to be ascribed to disease and how far to the food supply of the cotton. The present work is devoted to finding methods for ascertaining the nature and amount of the readily decomposable organic matter present in the experimental soils, in the hope that the application of such methods in the Sudan may assist in discovering some of the causes of the wide seasonal fluctuations in yield.

In the Department of Mycology the work on the Blackarm or Angular Leaf Spot disease of cotton plants, carried out by Dr. Stoughton, has been brought to a conclusion. The final experiments on the influence of environmental conditions on the disease have dealt with the effect of regularly alternating and of abruptly changing conditions. It has been found that the effect of a regular diurnal variation of soil temperature on the amount of disease developing on seedlings raised from infected seed is approximately equivalent to that of a constant temperature near to the mean of the fluctuations. That is to say, so far as soil temperature is concerned in the development of the disease, it is the mean temperature prevailing during the germination period and for the few days following that influences the amount of disease produced. Similar experiments on the influence of regularly alternating air temperatures on the development of the disease resulting from spray inoculation of established young plants show the same type of result, namely, that it is the mean temperature during the incubation period which conditions the resulting infection. Experiments on the effect of abrupt changes in temperature have served to confirm these results

and to show that changes of temperature lasting only a short time have little or no effect. Similar experiments on changes of humidity have shown that humidity is of importance only during the first day or two after inoculation and that subsequent changes have no effect on the disease. Accounts of all the experiments have been prepared for publication in the *Annals of Applied Biology*.

The Statistical Department has continued to supply advice to overseas experimenters upon the interpretation of field trials, and on the problems which arise in the design of satisfactory experiments. As an example of the type of work on which the Department is consulted reference may be made to the description of an experiment on the angular leaf spot disease of cotton in Uganda, shortly to be published in the *Annals of Applied Biology*.(1) This experiment is the first of a series which is to be continued in the present and following seasons. Another cotton experiment on which the Department was consulted in 1932 is used as an example of statistical procedure in a paper which will appear in an early issue of the *Empire Journal of Experimental Agriculture*.(2)

Studentships.

It was announced last year that, in view of the improbability of men who had completed their Studentship course being able to find employment, either on the Corporation's staff or on those of the Colonial Agricultural Departments, the Corporation intended to suspend for the present their offer of Studentships, which had been made annually since 1920. Four holders of Studentships were

(1) C. G. Hansford, H. R. Hosking, R. H. Stoughton and F. Yates. "An experiment on the incidence and spread of angular leaf-spot disease of cotton in Uganda."

(2) F. Yates. "The analysis of replicated experiments when the field results are incomplete."

completing the first year of their course; the position was explained to them, so that they might be in no doubt as to the uncertainty of their being able to find posts at the end of a further year's specialized training, and they were given the option of resigning their Studentships at the end of the first year and turning to other careers. They all decided, however, that they would prefer to continue their course for a second year, presumably in the hope that economic conditions might have improved before that year ended; they are accordingly now at the Imperial College of Tropical Agriculture, Trinidad.

Unfortunately, the circumstances in which the Corporation suspended their Studentships still persist. The Colonial Agricultural Departments appear unlikely to have more vacancies in the near future than it will be possible to fill from the pool created by the Colonial Office Agricultural Scholarship scheme, so that if the Corporation were again to provide facilities at the present time for the post-graduate training of more men, and were unable to offer them posts on their own staff, it is to be feared that they might experience considerable difficulty, in view of their specialized training, in finding suitable employment. The Committee feel, therefore, that it would be unfair to induce men to take up an advanced course of training of the type provided by the Studentships, unless there appears to be at all events a good probability that it will lead to a career for them. In these circumstances the Committee have decided to offer no Studentships for the year 1933-34.

Spinning Tests.

The number of samples forwarded, either for examination by brokers or for spinning tests, or for both, by Departments of Agriculture or by the Corporation's Experiment Stations,

showed an increase, 163 having been received, as compared with 125 last year.

All samples of American-type cotton were again tested and examined at the Shirley Institute, together with a few samples of Sea Island. Samples of Egyptian-type cotton, as well as some Sea Island samples, were tested at the Experimental Department of the Fine Cotton Spinners' and Doublers' Association, to whose Directors the Corporation are indebted for their courtesy in allowing these tests to be carried out.

An outline of the procedure followed at the Shirley Institute in carrying out these tests was given in the Corporation's Annual Report for 1929-30, but slight modifications have since been made, and a detailed description of the present routine was published in the *Empire Cotton Growing Review,* Vol. IX, No. 4, October, 1932.

In order to overcome the difficulties occasionally experienced by those who send samples for spinning tests in gauging the significance and relative importance of the several measures of cotton and yarn quality, the opportunity was taken to include in that article a note giving an explanation of the various terms used in the hair tests and spinning tests, and an indication of the degree of accuracy of measurement of the various characters, and the relative importance to be attached to them in interpreting the results of the tests.

Reference was made in last year's Report to a revised form for recording the spinning test results. This form, and another revised form for recording the results of the hair tests, have been in use during the year. These forms not only display the results in a more convenient manner, but

they also contain information that was not given on the old forms. Still another improvement has been the introduction of a form for use by the sender of the samples for test, on which he is asked to supply, whenever possible, details of the strain, stage of development, cultivation, climate, diseases, pests, etc., of the samples, and the particular objects he has in view in sending them to be tested. It is believed that the more complete interchange of information between those who grow the samples and those who test them will lead to a better understanding and to even greater utility of the results of these spinning tests.

Occasionally, the tests ordinarily employed in spinning tests may be supplemented by others designed to provide extra information concerning some specific point. An interesting example of this is afforded by the tests recently performed on two samples of Montserrat cotton. These samples were identical in all respects, except that one had been carefully picked over in order to remove all immature and aborted seeds before ginning, with the object of reducing, if possible, the tendency of the cotton to neppiness. Not only, therefore, were the yarns examined in the usual way for appearance, but special " nep counts " were made at the Shirley Institute on the samples in various stages of processing. The results showed that whilst there was practically no difference in the appearance of the yarns from the two samples, the ordinary sample contained rather more neps before combing than did the one which had been specially picked over, and it also gave slightly higher loss in the comber.

It was mentioned in last year's Report that the Agricultural Department of Nigeria is carrying out breeding experiments on various strains of Ishan cotton, with a view to eliminating the undesirable roughness characteristic of this

cotton. Samples were submitted for examination by the Spinning Tests Joint Sub-Committee and for hair tests at the Shirley Institute, and the results indicated that roughness was associated with high hair weight per centimetre. In continuation of this work, the Director of Agriculture, Nigeria, this year forwarded a further batch of 35 samples for similar examination. The Spinning Tests Joint Sub-Committee found little difference between the samples and stated that, with one possible exception, none would be condemned on the score of roughness. Measurements of the hair characters of these samples have made it clear that the "possible exception" is characterised by a much higher hair weight per centimetre than most of the others, and that the majority of the samples selected by the Agricultural Department for fineness have comparatively low hair weights per centimetre.

The Corporation are much indebted to all those who have again assisted in the examination and testing of samples. These include the brokers, and members of the staff of the Liverpool Cotton Association, the members of the Spinning Test Committee, and the staff of the Shirley Institute.

Mechanical Transport.

Following the practice of the last two years, a summary is given of the progress made by the Oversea Mechanical Transport Directing Committee, of which Sir James Currie is Chairman.

The Committee have been chiefly occupied during the past year in testing and improving the first 15-ton motor transport unit. This unit consists of an 8-wheeled tractor carrying 3 tons of the useful load, and two 8-wheeled trailers each carrying 6 tons. After covering 5,000 miles over earth

and gravel roads, hauling the full load of 15 tons, certain modifications were carried out in order to render the tractor more easily handled when manœuvring and to decrease the tare weight of the trailers.

The vehicles were shipped to the Gold Coast in February and are being tested under commercial transport conditions in that Colony. Detailed records are being kept to enable the running costs to be ascertained.

A second 15-ton unit has recently commenced its tests. The Committee have embodied in the component vehicles the improvements shown to be possible as a result of the tests of the first unit. The tractor is fitted with a heavy-oil engine, which should result in considerable economies in fuel costs. The first tractor was equipped with a petrol engine in order to avoid combining too many experimental features in one vehicle, as at the time when it was built the heavy-oil engine for motor vehicles was still in the development stage.

The Committee are also investigating the possibilities of building, if funds permit, a tractor and two trailers to handle a useful load of 30 tons. Such a unit should show considerable savings in transport costs, as compared with the charges necessary when handling 15-ton loads.

Trials of various motor vehicles likely to be useful for work oversea have been continued during the year. Confidential reports on these trials are circulated for the information of officers likely to be interested, and any shortcomings revealed by the tests are discussed with the manufacturers.

The publication of the *Quarterly Bulletin* has been continued during the year.

EMPIRE COTTON GROWING CORPORATION.

EMPIRE COTTON CROPS FOR THE YEARS 1922-32, EXCLUDING INDIA.

IN BALES OF 400 lbs.

The seasons are given as covering two years (*e.g.*, 1926–1927) because in the majority of the countries named planting takes place in one calendar year and picking in the next. In a few of these countries, however (*e.g.*, Tanganyika, Iraq, Cyprus, Malta and some of the West Indian Islands), the crop is harvested in the same year as that in which it is planted. In such cases the figures should be read as relating to the crop grown and harvested in the *latter* of the two years at the head of the column.

Country.	1921–22.	1922–23.	1923–24.	1924–25.	1925–26.	1926–27.	1927–28.	1928–29.	1929–30.	1930–31.	1931–32.	
(1) Anglo-Egyptian Sudan	24,074	28,306	47,652	44,912	121,131	148,118	126,115	161,536	157,769	120,310	234,964	(1)
(2) Uganda	48,290	88,046	128,604	196,038	180,859	131,728	138,486	204,057	129,969	191,305	203,265	(2)
(3) Kenya	417	1,200	1,653	2,250	2,046	1,232	1,241	1,984	1,518	800	1,735	(3)
(4) Tanganyika	7,175	11,434	18,793	21,724	24,280	15,966	32,954	27,785	23,136	11,322	16,500	(4)
(5) Nyasaland	5,422	4,036	6,873	7,718	4,976	2,792	4,470	6,095	9,331	4,205	5,067	(5)
(6) Northern Rhodesia ..	80	102	500	379	506	32	17	—	—	—	—	(6)
(7) Southern Rhodesia ..	—	—	1,650	4,907	6,803	639	90	280	1,481	1,974	579	(7)
(8) Union of South Africa and Swaziland ..	2,740	6,523	8,730	16,936	20,381	10,242	11,013	9,774	16,213	8,123	2,801	(8)
(9) Nigeria	15,096	16,811	25,694	39,137	47,909	27,464	20,930	32,126	43,925	18,850	6,268	(9)
(10) Gold Coast	49	15	93	1,132	1,218	285	264	296	200	297	263	(10)
(11) Cyprus	1,505	2,233	3,397	3,320	4,614	2,110	2,146	3,610	4,778	2,827	1,194	(11)
(12) Malta	193	118	573	782	507	342	541	379	293	201	41	(12)
(13) Iraq	300	1,100	2,400	2,540	3,500	1,800	5,200	4,700	3,300	960	409	(13)
(14) Ceylon	—	49	324	121	261	186	202	380	248	95	52	(14)
(15) Queensland	3,140	9,344	11,850	14,318	7,179	5,880	10,266	6,296	13,999	12,228	4,975	(15)
(16) Fiji	—	85	157	123	824	356	114	271	398	266	90	(16)
(17) West Indies	4,314	5,295	4,309	4,186	5,941	6,076	4,088	5,312	5,672	5,106	2,524	(17)
	112,795	174,697	263,252	360,523	432,935	355,248	358,137	464,881	412,230	378,869	480,727	
		Percentage Increase 54·8.	*Percentage Increase* 50·6.	*Percentage Increase* 36·9.	*Percentage Increase* 20·0.	*Percentage Decrease* 17·9.	*Percentage Increase* 0·8.	*Percentage Increase* 29·8.	*Percentage Decrease* 11·3.	*Percentage Decrease* 8·1.	*Percentage Increase* 26·8.	

EMPIRE COTTON GROWING CORPORATION

MILLBANK HOUSE, 2, WOOD STREET, MILLBANK, LONDON, S.W.1.

LIST OF PUBLICATIONS ISSUED TO DATE TO BE OBTAINED DIRECT FROM THE CORPORATION AT THE ABOVE ADDRESS.

"Cotton Growing within the British Empire and The World's Capacity for Consuming Cotton Goods." J. W. McConnel. 1921. Price **2s.**, post free.

"Cotton Growing in Nigeria." Sir Hector Duff. Price **2s.**, post free.

"The Extension of Cotton Cultivation in Tanganyika Territory." Major Hastings Horne. 1922. Price **2s.**, post free.

* "Cotton Cultivation in Nyasaland." H. C. Sampson. 1922.

"Cotton Growing in South Africa." G. F. Keatinge. 1923. Price **2s.** post free.

* "Cotton Growing within the British Empire." L. G. Killby. 1924.

"A Cotton Research Station for the British Empire." Professor J. B. Farmer and Mr. L. G. Killby. 1925. Price **2s.**, post free.

"Report on the Cotton-Growing Industry in Uganda, Kenya, and the Mwanza District of Tanganyika." Col. C. N. French. 1925. Price **1s. 3d.**, post free.

"Reports received from Experiment Stations for the Seasons 1923, 1924, and (South Africa only), 1925." Price **2s.**, post free.

"Memorandum by the Mechanical Transport Sub-Committee." Mr. G. H. Baillie, Mr. R. H. Brackenbury, Col. C. N. French. 1925. Price **2s.**, post free.

"Report on the Cotton-Growing Industry of Nigeria, 1926." Col. C. N. French. 1926. Price **2s.**, post free.

"The Principles and Practice of Yield Trials." F. L. Engledow and G. Udny Yule. 1926. Price **2s.**, post free.

"Reports received from Experiment Stations, 1925–26." Price **2s. 6d.**, post free.

"Report on Suitable Rotation Crops for Cotton." H. C. Sampson. 1927. Price **1s.**, post free.

"Cotton Growing in Southern Africa and the Rhodesias." Report on a Tour undertaken by Sir James Currie, Mr. J. S. Addison, and Mr. H. C. Jefferys. 1927. Price **2s.**, post free.

"Reports received from Experiment Stations, 1926–27." Price **2s. 6d.**, post free.

* "Reports from Turkestan Plant Breeding Station, Tashkent." 1928.

"Review of the Situation in the Principal Cotton-Growing Territories of the Empire, and a Summary of the Main Activities of the Corporation since their Formation." 1928. Price **6d.**, postage extra.

* Out of print.

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LIST OF PUBLICATIONS—*continued*.

" Report on Cotton Breeding and Seed Supply in Nigeria, 1928." F. L. Engledow and C. N. French. Price **2s.**, post free.

* " Memoirs of the Cotton Research Station, Trinidad." Series B. Physiology. No. 1. Studies on the Transport of Carbohydrates in the Cotton Plant. T. G. Mason and E. J. Maskell. 1928.

* " Reports received from Experiment Stations, 1927–28."

" Memoirs of the Cotton Research Station, Trinidad." Series A. Genetics. No. 1. The Inheritance of (i) Petal Spot, (ii) Pollen Colour, (iii) Corolla Colour. S. C. Harland. 1929. Price **2s. 6d.**, post free,

" Reports received from Experiment Stations, 1928–29." Price **2s. 6d.**, post free.

" Memoirs of the Cotton Research Station, Trinidad." Series B. Physiology. No. 2. Studies on the Transport of Nitrogenous Substances in the Cotton Plant. Parts I, II and III. E. J. Maskell and T. G. Mason. 1930. Price **2s. 6d.**, post free.

" Memoirs of the Cotton Research Station, Trinidad." Series B. Physiology. No. 3. Studies on the Transport of Nitrogenous Substances in the Cotton Plant. Parts IV and V. E. J. Maskell and T. G. Mason. 1930. Price **2s. 6d.**, post free.

" Conference of Workers on Cotton Growing Problems, held August, 1930." Papers and Discussions. Price **2s. 6d.**, post free.

* " Reports received from Experiment Stations, 1929–30."

" Memoirs of the Cotton Research Station, Trinidad." Series A. Genetics. No. 2. Studies on the Inheritance of Corolla Colour and Petal Size in Asiatic Cottons. J. B. Hutchinson. 1931. Price **2s. 6d.**, post free.

" Reports received from Experiment Stations, 1930–31." Price **2s. 6d.**, post free.

" Memoirs of the Cotton Research Station, Trinidad." Series A. Genetics. No. 3. (*a*) Reversal of Dominance in the Interspecific Cross *G. Barbadense* Linn. × *G. Hirsutum* Linn. and its Bearing on Fisher's Theory of Dominance. (*b*) The Inheritance of Chlorophyll Deficiency in New World Cottons. By S. C. Harland. (*c*) " Crumpled." A New Dominant in Asiatic Cottons produced by Complementary Factors. J. B. Hutchinson. 1932. Price **2s. 6d.**, post free.

" Memoirs of the Cotton Research Station, Trinidad." Series A. Genetics. No. 4. The Inheritance of Anthocyanin Pigmentation in Asiatic Cottons. J. B. Hutchinson. 1932. Price **2s. 6d.**, post free.

" Reports received from Experiment Stations, 1931–32. Price **2s. 6d.**, post free.

" Memoirs of the Cotton Research Station, Trinidad." Series A. Genetics. No. 5. Cytological Studies in Cotton. I. The Mitosis and Meiosis in Diploid and Triploid Asiatic Cotton. A. Skovsted. 1933. Price **2s. 6d.**, post free.

* Out of print.